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General expense and cost summaries: instruction paper

Charles E. Hathaway

National Association of Merchant Tailors of America. Business Efficiency Committee

GENERAL EXPENSE AND COST SUMMARIES

AMERICAN SCHOOL OF CORRESPONDENCE
CHICAGO, ILLINOIS

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INSTRUCTION PAPER

PREPARED BY

CHARLES E. HATHAWAY

CHIEF ACCOUNTANT, FORE RIVER SHIPBUILDING CO.

AND

JAMES B. GRIFFITH

HEAD, DEPT. OF COMMERCE, ACCOUNTANCY, AND BUSINESS ADMINISTRATION. AMERICAN SCHOOL OF CORRESPONDENCE

AMERICAN SCHOOL OF CORRESPONDENCE

CHICAGO ILLINOIS

U. S. A.

GENERAL EXPENSE AND COST SUMMARIES

EXPENSE DISTRIBUTION

1. In order to obtain a thorough understanding of a subject, and to gain a clear insight into the various questions involved, so that one may understand not only its underlying principle, but also its operation in detail, it is quite essential to know first, *why* a thing is done, and second, *how* to do it. While a general knowledge of a subject is always desirable, and to be commended, it is often found insufficient when put to the test. Special subjects require special consideration and study, especially when the how-to-do-it is involved.

On the subject under consideration this is particularly true, for it seems to be a common confession among those handling factory accounts, that while they know in a general way how their expense accounts should be treated, they seem to be in a maze when it comes to actually doing it. The "knowing how" is the best asset of a good accountant; and in these days when the subject of costs is of vital interest to the manufacturer, the up-to-date accountant has the opportunity to show his value. To make the necessary repairs to a touring car broken down on the country road may take but one dollar's worth of the repairer's actual time, but the "knowing how" may be worth ten dollars to him when rendering his bill, and usually is.

While it is realized that there are differences of opinion among accountants on some of the questions considered in the presentation of this subject, it is the intent of this article to present what is generally conceded by our leading accounting authorities as the best practice in a well-organized, up-to-date, industrial plant, and to so present the subject to the prospective student that he may fully understand and master the "why" and the "how" of this important question in factory accounting.

That the subject may be carefully considered in all its various

phases, it will for convenience be developed under the following general divisions in the order in which they are naturally suggested:

(1) Basis of Expense Distribution.
(2) Methods of Expense Distribution.
(3) Percentage Method Exemplified.

BASIS OF EXPENSE DISTRIBUTION

2. True Cost—What Is It? Without trespassing on the general subject of cost accounts, it is quite essential to clearly establish at the very outset what constitutes *true cost.* It would be difficult to conceive of a manufacturer to-day who would simply take the value of wages paid and material used for a cost price, and to this amount add the usual percentage of profit he desires to make on his output, and sell at that price. It would be folly to attempt business on any such basis. No business can be conducted without expense, and yet, in the case just cited, the manufacturer has simply ignored it. Suppose the expense of conducting his business exceeds the percentage he added for profit, what then? He soon finds he has made a serious error in figuring his cost, and the item omitted is the cause of his business losses. His selling price was based on less than the true cost of his product and it is noted he has made no provision, in making up his cost price, for covering the expense of operating his factory, his offices, and general expense, including insurance and taxes. It is apparent then that this matter of *expense* has a very important bearing on the cost, in fact is a part of it, and must be carefully considered in making up the cost records. The factor of expense is frequently found to be greater than the direct labor cost itself, and a successful manufacturer must know how much expense his costs should absorb and how to figure it. The sales from his product must more than pay for the direct cost to manufacture and all the expenses of his factory besides, and if his sales are not sufficient to pay for both there is no profit. This expense, then, is an indirect charge to the cost of production, and must be included in it before the selling price can be established. Many a manufacturer has been ruined by not properly handling his manufacturing expense, and the necessity for its careful consideration cannot be emphasized too strongly.

Mr. Clinton E. Woods, one of our leading authorities in factory

organization and accounting, very clearly states that expense and "overhead" charges must be absorbed into the cost of production as much as labor and material, by which operation expense is really converted into an asset.

True cost includes first, *direct labor;* second, *material;* and third, *expense.* The last item will admit of further sub-division and originates from two different sources: First, the expense of operating the work-shop or factory itself; and second, the general expense of offices and administration.

The cost of production, therefore, resolves itself into the following elements:

	$
Direct labor	
Material	
Factory expense	
Factory cost	
General expense	
Manufacturing cost	

3. Selling Expense. *Selling expense,* oftentimes spoken of as *commercial expense,* has no bearing on cost price. The correctness of this position is easily shown. Two manufacturers, competitors in the same line of production, both operating up-to-date plants with the finest equipment, may produce at the same cost. The expense necessary to market the product from one factory may be so excessive as to cause one concern to lose business to their competitors who can sell their output at less expense, while the actual cost to manufacture may be identical in both shops. Again, while one manufacturer, who can produce at a low cost but carries a heavy selling expense, may conduct his business at a loss, his next door rival in trade may not be able to manufacture as economically but can sell his product with less expense, and thereby carry on a profitable business. In the two instances cited, the key to the losses of one manufacturer and to the profits of the other is in the expense of selling, and not in the cost of production.

In a large plant with an elaborate, well-organized, and expensive sales division, where the dividing line between the commercial and production expense is clear cut, these two expense accounts should be kept entirely separate; the commercial being charged off to *Loss*

and *Gain* direct, while the latter only should be merged into manufacturing cost.

In a small plant, where the selling division is conducted through the general office at an expense so small as not to affect the cost of administration over what would be necessary for manufacturing purposes only, or where there is difficulty in separating the selling from the manufacturing expense, the two are often combined as general expense and pro-rated as one account into production costs.

Theoretically, selling expense is not a charge to production, but the dividing line between this view and the practical one in most cases is a very fine one, and in the interest of simplification instead of elaboration, the commercial will be treated in this presentation of the subject as a part of the general expense, and will be considered in detail later.

4. Expense Based on Cost Price or Selling Price. Having shown that expense is of necessity an item which must enter into true cost, the question at once arises as to what it is related. Is the amount of expense to be borne by any article of production based on its cost or its selling price? While it is noted that some accountants claim the latter should be the basis for calculation, the consensus of opinion seems decidedly in favor of the cost price as the correct one, and there seems to be good argument for the stand thus taken:

(a) Inasmuch as the selling price cannot be established until the cost price has been ascertained, which is to include the expense, it is apparent that the expense must be calculated from data already in hand; either the direct labor or material cost. The selling price is established after, and contingent on, the cost price, not the reverse.

(b) Again, the selling price may vary according to the demands of trade; different prices to different classes of customers, as well as the wholesale and retail prices for the same article. In either case, the cost price is the same and is not influenced one way or the other by the selling price. The selling price may fluctuate while the cost price remains positive and stationary.

(c) While the selling price is theoretically based on cost, it is often fixed by the trade, or regulated to meet competition regardless of cost, and the expense accounts are found to continue about the same each month whether the selling price is high or low.

(d) In times of depression, or when business is slack, it is

common practice to "mark down" the selling price and increase the amount of sales at a smaller percentage of profit.

(e) It is difficult to see wherein there would be any difference in the expense of manufacturing an article which sells at $110.00 over what it would be were the price but $100.00, yet there would be if the selling price were used as a basis.

Other reasons will suggest themselves, but these just referred to are quite sufficient to show that the selling price is too erratic and that expense will be found more reliable when figured at cost price, which method has, therefore, been adopted as the best practice.

5. Expense Based on Cost of Labor or Material. Having decided that expense should be reduced in some manner from the direct cost price rather than the selling price, it is remembered that we still have two items of cost to choose from: The labor cost and that of the material. There are those who maintain that the material cost is the correct starting point for calculations, but there are few manufacturers, if any, who do this.

An attempt has been made to use the combined total of labor cost and material, but this method is hardly worthy of serious consideration. The best practice points almost without argument to the labor cost as the true basis of expense; this is not only the logical conclusion but common sense:

(a) It is easy to see that the elements which go to make up the expense of operating a factory—foremen, sub-foremen, supervision, shop clerks, toolkeepers and grinders, helpers, the up-keep of tools and machines, lighting, etc —are all closely related and largely dependent upon the number of men employed. Reduce the number employed and it will be seen at once that some of the above mentioned items of expense can be cut; less supervision is required and the wear and tear on tools and machinery is also reduced. It is difficult to see wherein any difference in cost of the material used would of itself cause any increase or decrease in the factory expense or even be influenced by it. It is quite contingent on the labor.

(b) That the cost of the material is not a reliable basis for calculating expense can be quite satisfactorily demonstrated. If the cost of an article is, say, labor $25.00, material $50.00, with expense to be figured at 50% on material, or $25.00, it is seen at once that the manufacturing cost would be:

Labor	$25.00
Material	50.00
Expense	25.00
Cost	$100.00

Suppose this article were duplicated under the same identical conditions and cost, using only this time material that cost $60.00. It is a fair proposition that the total cost would be but $10.00 more than in the first instance, or $110.00. But if the percentage is added on the material as before, it is found that the expense this time is $30.00, which would make the cost appear thus:

Labor	$25.00
Material	60.00
Expense	30.00
Cost	$115.00

It is now noted that the cost figures $15.00 more than in the first instance, while we are quite ready to admit it should be but $10.00, the only difference being in the cost of the material.

6. Conclusions. Having established the fact that the expense is a legitimate charge to the cost of production, we are now quite safe in laying down for our foundation the proposition that expense is contingent on, and should be figured from, the direct labor value of the cost price.

METHODS OF DISTRIBUTION

7. Time is continually bringing improvements; old methods once thought practical and satisfactory are replaced by more efficient ones to meet the exacting conditions of to-day. Examine a *Practical Bookkeeping-Manufacturer's Edition* of thirty or forty years ago and you will probably find nothing on this subject of *expense distribution,* while to-day it is one of the most important and most discussed of any in factory accounting in general, and cost accounting in particular. Since that time different methods of handling expense have been devised, some with more or less merit. It will be the intent of this section to consider at some length three of the most frequently used of these methods, endeavoring to find one which will, in the most equitable manner, distribute into production the operating expense of a factory with the least amount of detail and unnecessary figuring on the part of the accountant; and at the same time prove satisfactory from the manufacturer's standpoint.

8. The Man-Hour Rate Method. This method, once quite popular, is now but little used, and it is doubtful if it can be found in operation in many up-to-date plants at the present time. The name of the method suggests its intent, which was to distribute factory expense over the various production job orders according to the amount of time spent by the workmen at an hourly rate. This rate is easily calculated, and was established by dividing the total expense for any period by the total number of hours spent on productive work for the same period, reducing the rate of distribution to so much per hour. If 100 hours of labor were spent on a productive job, the cost of the wages paid the workman for this time was not considered, the expense to be borne by the job being figured at the hourly rate for the 100 hours. It will be seen that this is hardly an equitable arrangement, and to rectify a serious defect in the method, some adjustment must be made:

(a) The inability to fix a standard for the efficiency of the labor lays the man-hour rate open to criticism. Could this be done, this method would in many cases prove a very equitable way of distributing expense. It will, however, be seen at once that as it is, a skilled workman carries no more expense than an apprentice boy, and if both work on a productive job a full week, the expense in either case is the same regardless of the wages paid. This is hardly a fair proposition. Either the apprentice's time must be accepted as standard and the skilled workman considered twice as efficient in work-hours, or *vice versâ*. To do this would lead to endless complications, yet the quantity and quality of the output between these two classes of labor should be considered and adjusted in some way so that the injustice done the manufacturing cost may be corrected. But this is not an easy matter to regulate, and means extra work on the part of the cost clerks in recording the time spent on job work and adjusting these inequalities in the labor.

(b) The man-hour rate requires that the hours worked be carefully recorded and totaled, as well as the cost. Many concerns with heavy pay-rolls to be apportioned over a large number of job orders, ignore the footing of the long columns of hours and fractions, and use only the totals of labor cost, which are of course necessary for entry in the commercial books. It is obvious that in doing this an immense amount of clerical labor is saved. The man-hour

method requires that both hours and labor cost should be recorded and totaled—a double operation and duplication of work, which, unless it can be simplified, should be avoided, as it means time and unnecessary expense.

9. Machine-Hour Rate Method. This machine-rate plan of distributing expense was designed to meet the needs of a shop where the product is largely the result of a machine or tool operation, rather than the labor of the mechanic himself. It somewhat resembles the man-hour plan in that the rate of distributing expense is reduced to an hourly rate for the time the machine is working on the job instead of the time of the operator. Each machine is intended to have its own rate.

The method of arriving at the machine rate is easily understood, and reduces itself to the item of depreciation on the original cost price of the machine with its shafting, belting, tools, and installation cost figured at, say, 5%, the power to operate machine at an estimated cost per horse-power, ordinary repairs, divided by the number of hours the machine is estimated to be in operation for the same period; this will give the hourly rate of cost to operate. Some mechanical engineers advocate including in the above cost, interest on the investment at 6%, also insurance and taxes; and by others, the value of the floor space occupied by the machine is also included; but in all these latter points referred to, engineers greatly differ in opinion, and it is generally decided by each manufacturer for himself according to his own ideas.

On the question of the value of machine rates there is probably more argument by mechanical engineers and accountants than on any question in factory accounting; in fact, engineers themselves are very far apart in their opinions and do not seem to agree among themselves. Accountants generally are inclined to take a somewhat different view of the situation from our mechanical friends. While it is admitted there is good argument for both positions, it is to be remembered that we are considering the question of machine rates as a means of distributing the expense account, and it seems to be the prevailing opinion among accountants that as such it is found wanting. While, theoretically, it is undoubtedly the correct solution of the problem, it is more often found in practice to be a case of a "distribution that does not distribute," and for this reason is not used

by the very class of factories and machine works for which it was designed and intended to benefit.

Let us consider in detail a few of the objections that may be raised to the machine-rate method:

(a) It will be noticed there are other expenses in the shop than that of operating the machines and not covered at all by the machine expense. Machine rates are absolutely worthless for bench labor and the assembling room, for these two must also share in carrying the shop burden. Not to do so would be manifestly unfair. It is therefore necessary that a second distribution must be made entirely different in its calculation, to handle this undistributed expense not covered by the machine rates, which means two different operations for the same shop.

This necessitates two different time records to be kept, one card for each machine showing jobs worked on and hours idle, and another time card for the workman. Is is easy to appreciate that this double operation greatly increases the clerical work in the shop, besides two sets of entries by the cost clerks, and more detail for all concerned. If a method can be found which requires but one time record to be kept, this double process can be done away with and the duplication of work avoided.

(b) The principal factor in the calculation of the machine rate, in fact, the real key to a successful calculation, is in establishing a standard of work-hours for each machine. It is noted that the higher the standard, the lower will be the rate, and the lower the hours operated, the higher will be the rate; in other words, when the machine is idle in excess of the standard, the rate changes. In some shops where the output is a stable product, always in demand, and the machine in continuous operation, a good estimate may be made, but in most shops a machine is frequently idle on account of "no work" or "laid up" for repairs the same as is its operator. The practice in most shops is such that it is extremely difficult to estimate ahead what the work-hours of a machine will be, and it resolves itself generally into an intelligent guess with two estimators far apart in their estimates, yet a satisfactory distribution requires a standard which will work out in figures close to the actual facts.

Who can successfully estimate ahead for any time the activity of each machine in a large factory? Our factory engineers are at

wide variance on this point. One authority says "full time," 300 days a year, is the proper basis for calculation. It would seem as if this were rather an unusual position to take; it apparently being his belief that the time idle would be offset by the time the machine was operated overtime, or else he expected the machinery once put in motion to neither shut down, nor break down. Either appears to be rather a dangerous assumption on which to base a careful calculation for rate of distribution.

Another engineer says 80% of a full day will be found to be the maximum, and further adds: "It will doubtless fall much below that figure." One naturally asks "How much lower?" There is quite a large field of figures to choose from between an 80% activity and a dead standstill for the machine.

It is quite unnecessary to attempt to demonstrate at length that the work-hour standard may be a very elastic figure, and it is often found that after distribution has been made, the results are very unsatisfactory and the machine rates used have proved "way off."

(c) Again, having settled on the work-hour standard, other adjustments appear necessary to equitably handle the machine rate question. For instance, two machines may be of the same book valuation and in cost of operation practically alike, yet one may be far more efficient than the other and possibly turn out two or three times as much work. This condition is constantly found in different shops, and whether or not the two machines should carry the same rate, and, if not, how this inequality shall be adjusted, forms a very interesting question for discussion.

(d) It is noted that the essentials in the calculation of machine rates are all based on estimates which may or may not prove correct; that positive book figures are lacking; and that the calculations are made on assumptions. One of the best professional opinions noted is that expressed by one of our leading accountants, who, commenting on the question of machine rates, observes that "it begins with estimating and is estimating all the way through." This appears to be rather severe criticism, yet one has but to give the subject careful consideration to note that it quite correctly sums up the situation in a few words.

As previously stated, the machine-rate method is without doubt theoretically correct, but, until the subject has been more thoroughly

elucidated and worked out in all its details to fit shop conditions and furnish a satisfactory means of distributing expense, it is doubtful if it will be used to any great extent. This method certainly requires an elaboration of system and detail, with questionable results, and with many serious objections apparent; it seems pertinent, therefore, to ask the question "Is it worth while; cannot something better be devised?"

10. The Percent Method. A third plan of distribution, commonly referred to as the *percentage method*, differs from the two already outlined, in which the time employed was the basis of operation, in that the rate of distribution is a percentage on the direct labor cost of the product, which is, of course, commensurate with the amount of time expended. In the first division of our subject, it was shown that expense figured on direct labor would prove the most reliable.

This method is based on the principle that the production of each department of a plant should shoulder its own expense, and also a share of the general expense. In other words, the cost of the output from the *Blacksmith Department*, for instance, would be the total productive labor of the department, plus the material used, plus the operating expense of the department, plus its share of the general expense of the whole plant. It is only necessary, then, to establish the relation between the productive labor and the expense, and express the same in a percentage. It is immaterial how many departments or processes there may be in the factory; this relation should be found in each case, based on its own productive labor and expense, each department having its own percentage ascertained from its own actual conditions; no estimating about it. The expense, then, is figured on the labor cost. If, in the *Blacksmith Department* already referred to, it is found that the expense at which the department is operated is one-fourth of its total productive pay-roll for the same period, it is at once apparent that if to the labor cost of every productive job, 25% is added for shop expense, the total of these expense items added will equal the total expense of the department. In other words, the shop expense is split up and added to each job in proportion to the labor expended on it.

The general expense is handled the same way. If the total general expense is found to be one-third of the total productive labor in the plant, it is likewise apparent that, if to the labor of every

productive job, 33⅓% is added to cover general expense, the sum total of these percentage items added will equal the total general expense of the plant.

Following, then, the formula outlined at the opening of our discussion under the heading of *True Cost*, the cost of a job done in the *Blacksmith Department*, on which the direct labor cost was $100.00, would appear on our records as follows:

Direct labor	$100.00
Material	50.00
Factory expense at 25%	25.00
Factory cost	175.00
General expense 33⅓%	33.33
Manufacturing cost	$208.33

This is the *percentage method.* While it is quite natural in anything of value and merit to look for its imperfections, this method is criticised by some accountants who point to flaws in its logic and method of computation; nevertheless, it stands to-day as the best solution of the vexed question of expense distribution that has yet been devised, for it not only has the approval of our best technical authorities, but that of the practical accountant as well. It commends itself to the intelligent judgment of the manufacturer, who is quick to realize its superiority, and it can be recommended for many reasons:

(a) It is based on actual figures, easily extracted from the regular books of account, and which are a true statement of fact; no guess-work or estimating about it. There is no better way to figure what is to be, than to use results of what can be conclusively demonstrated already has been.

(b) It can be used in any manufacturing plant, or in all the departments of the same plant, thereby insuring uniformity of method, which is always desired. No argument is necessary to convince that two methods in the same factory are undesirable when one can be found that is satisfactory.

(c) It accomplishes its purpose—it distributes. If it is found that factory conditions are changing, the percentages used may also be changed so as to increase the amount of expense distributed, or diminish it, as necessary.

(d) It requires less work for the cost accountant. The man-hour plan requires the hours worked to be recorded and footed in addition to the labor cost. The machine-rate plan requires not

only two different calculations, as already shown, but also necessitates the adding of all the hours worked. The percentage plan requires only the labor cost in money value, and renders the recording and adding of long columns of hours entirely unnecessary, which, as can readily be seen, is an immense saving of labor. In a large plant with an elaborate system of job orders to be handled, the value of the percentage method, in doing away with this double calculation, will be appreciated immediately.

(e) Figuring by percentages can be done rapidly, and in many instances it is but a mental calculation and almost instantaneous. Were hours recorded, the frequent use of fractions would render the process of figuring expense less rapid.

(f) It is an equitable means of distribution, for it is based on the direct labor cost, which is not only the most reliable element of cost to use as a basis, but which is one of the principal factors by which the amount of expense is influenced.

(g) It has the endorsement of our best factory accountants and auditors, and it is noted that where "systems" are being installed by factory organizers to-day, the percentage method is continually being adopted as the most satisfactory, for it brings the best results with the least machinery to operate.

PERCENTAGE METHOD EXEMPLIFIED

11. Before proceeding to show in detail the method to be pursued in arriving at the various percentages to be used in distributing expense by the *percentage method*, it may be well at the outset to clearly understand what constitutes *productive labor* and *expense*, or *non-productive labor*, for it is on the former that all calculations are based.

12. Productive Labor. The wages paid to the workmen for labor spent on productive work which is offered by the manufacturer for sale, and from which the business derives its regular revenue, is properly classed as *productive labor*. In other words, the amount of productive labor is commensurate with the productive output.

It is frequently asked whether labor spent on plant extensions or new equipment, when made for one's own use, may be considered productive labor and should carry its share of the expense in its distribution. Most assuredly, yes. If this same work were performed

to be sold again in trade it would be considered productive labor and the expense would be added. The reverse is also true; if it were purchased from another manufacturer he would treat it as productive labor, and include expense in his cost and selling price, and the purchaser would have to pay for it, and would carry same in his ledger, in his plant or equipment accounts, and on his balance sheet as an asset. The only difference, if any, is in making new equipment himself, in which case it goes on his books at the cost price to him, thereby saving the manufacturer's profit he would have to pay if he purchased it. Is it, then, any less productive labor because a manufacturer prefers to make his plant extensions or new machinery, himself, instead of buying? It does not appear so; it certainly is productive labor.

13. Non-Productive Labor. All other labor, not distinctly productive as just outlined, must be classed as non-productive. This includes *clerks* and *offices, foremen, assistants, watchmen, repairs* and *renewals, small tools*, etc., and all the many expense men not working on product but necessary to keep the plant in repair and operation. Non-productive labor is a question of keeping the factory organization and management up to concert pitch, and is not regulated by the quantity of production.

Inter-department work in a plant often raises an interesting question. Shall labor expended by one department on repairs for another department receive credit for same as productive labor? The foreman of the department often claims that the repairs his men are doing for another department are just as much production, so far as he is concerned, as though his men were building a machine for sale, and should shoulder part of his expense. In a certain sense, all labor is productive, and from a selfish point of view, the foreman's argument is a fair one. But from the broader view of the manufacturer, all such inter-department repairs, or similar work, are a part of the operating expense of the plant, and are necessary for the upkeep of the equipment; they are not made for sale, as is a production order, and must be carried as expense — non-productive labor.

14. Expense and Production Cost Ledgers. Without digressing from our general subject, it may not be out of place at this point to call attention to a most convenient method of keeping cost records. Inasmuch as the cost of production must absorb the expense costs

of manufacturing, it will be found advantageous to keep these two classes of accounts in separate binders, putting all the non-productive labor cost records in one binder, calling it *Expense Ledger No. 1*, and all the productive labor in *Production Ledger No. 2*. When the expense distribution is to be figured, it will be noted that all the entries will be made in *Ledger No. 2*, while *Ledger No. 1* furnishes the amount and details of expense to be distributed.

15. Period for Comparisons. Having shown that our percentages of distribution are based on the relationship of total expenses to total of productive labor, the first step in our calculation is to draw off from our ledgers a statement of each for the same period as a basis for comparison.

Labor

1908		
Jan	Per Vo. Reg.	4 0 7 5 5 20
Feb	"	4 1 2 6 0 72
Mar	"	5 1 9 8 5 41
Apr	"	3 9 7 2 9 68
May	"	4 0 3 1 1 92
June	"	5 2 0 7 9 06
		2 6 6 1 5 5 00

Fig. 1. Private Ledger Labor Account

Inasmuch as there is generally found to be some item of extraordinary expense that appears each month, comparisons made on conditions shown by one month's operations are apt to be found abnormal, while a comparison made on results of operations extending over six months or more will give an average nearer the true condition of the plant's activities than one made on results shown by a shorter period.

16. Pay-Rolls Dissected. For our first statement, let us examine the pay-rolls and find out what portion may be classed as non-productive labor and what as productive labor, both by departments and in totals, our examination of same to cover a period of six months as just suggested.

For the sake of illustration, let us take a plant with a weekly

pay-roll of about $10,000. Ordinarily there will be four pay-rolls each month, but in order to provide for thirteen rolls quarterly, it will be necessary every third month to have the labor account cover five weeks instead of four. Turning to our *Private Ledger*, we find our *labor account* appears as shown in Fig. 1.

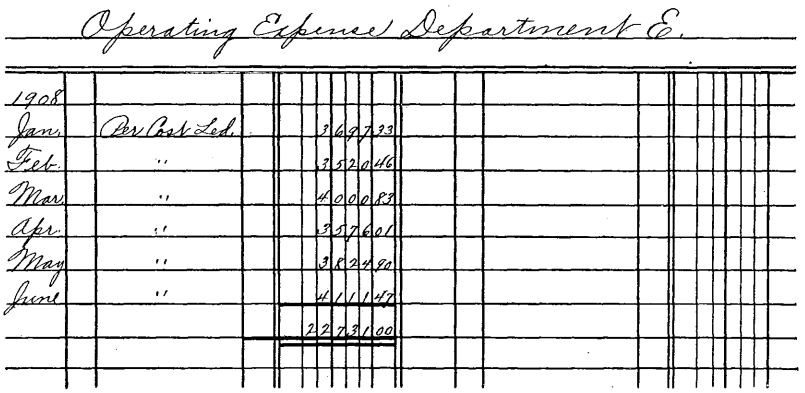
It is now seen at a glance that the total pay-roll for six months is $266,155.00. It is now necessary to know the split-up of the above figures into productive and non-productive labor by departments, and this is easily obtained. By reverting to the pay-sheets, can be found the total pay-rolls for each department during the above period, and from *Ledger No. 1* can be found the portion of these same rolls that were classed as non-productive labor, and the balance will be found entered in *Production Ledger No. 2*, the sum total of which will in each case balance with the totals in the *Private Ledger*. Every dollar of labor is accounted for in either one or the other of the two cost ledgers. Having done this, the labor statement resolves itself into something like the following:

PAY-ROLL DISTRIBUTION
Jan. 1 to June 30, 1908

	Non-Productive Labor	Productive Labor	Total Pay-Roll
Dept. A-Offices	$9,828|00		$ 9,828|00
B-Store	2,180|00		2,180|00
C-Power	4,524|00		4,524|00
D-Yard	9,316|00		9,316|00
E	9,971|00	104,409|00	114,380|00
F	7,082|00	31,429|00	38,511|00
G	1,749|00	5,528|00	7,277|00
H	2,488|00	10,659|00	13,147|00
I			
J			
K			
Etc.			
Totals	58,021|79	208,133|21	266,155|00
	21|8%	78|2%	

The above figures are all that are needed so far as the labor end of the comparison is concerned. In fact, the non-productive labor is not necessary and is shown here merely as a matter of interest, as are also the proportionate percentages of each division to the total pay-roll, for it will be remembered that the productive labor is the figure used in all costs on which the expense is calculated.

17. Departmental Expenses. Against the amount of productive labor for each department shown in the statement just made, place the total expenses for the same departments. This is readily found by again referring to the *Private Ledger*, where the amount of *Operating Expense, Department E*, for the same months the pay-rolls were tabulated, appears as in Fig. 2. The expenses of all the other departments should be similarly treated.


Operating Expense Department E.

1908			
Jan.	Per Cost Led.		3 69 77 33
Feb.	"		3 52 04 46
Mar.	"		4 00 08 53
Apr.	"		3 57 60 01
May	"		3 82 49 90
June	"		4 11 11 47
			22 73 31 00

Fig. 2. Private Ledger Operating Expense Account

18. General Expense. The general expense of a plant, for the sake of convenience as well as information, is kept usually in considerable detail, different ledger accounts being opened to carry the various subdivisions of expense. The use of a *General Expense Account* in the ledger is not recommended, for its very name has the earmarks of a general dumping ground for all miscellaneous items, and is often found a convenient place to hide expense, trusting it will there be lost sight of and thereby escape observation.

The combined total of these various expense accounts is the total general expense, a part of which each productive job is to carry. As they now appear in the ledger as separate accounts, *Executive, Office, Store, Power, Yard, Taxes, Insurance, Printing* and *Stationery, Telephone* and *Telegraph, Postage*, etc., it will be seen that each account is in itself but a part of the amount to be distributed, and, to better show this combined total, these individual accounts should be closed out monthly and brought together in another account, called *General Expense Distribution*. This is done by journal entry.

These accounts are now balanced out and combined in total in

Dr.			Cr.	
$10,293	28	General Expense Distribution		
		Executive Salaries		
		Insurance		
		Taxes		
		Depreciation		
		Freight		
		Express		
		Cartage		
		Printing and Stationery		
		Telephone and Telegraph		
		Traveling Expense		
		Postage		
		Legal		
		Water		
		Advertising		
		Etc.		
		Operating Expense Dept. A		
		" B		
		" C		
		" D		
			$10,293	28

the *Distribution Account.* The *Distribution Account* is now examined to ascertain the total general expense for the same six months previously used, and the *Private Ledger* shows it to be $67,840 00, Fig. 3.

19. Power. While the cost of operating the power-house is unquestionably a legitimate charge to the operating expense of each department according to quantity used, it is noted that, by the journal entry just made, the cost of same is closed into *General Expense Distribution.*

In a plant operating a central power station with electrically driven machinery, the power used in each shop can be metered and accurately known, in which case, each shop can be charged with the amount actually used. To do this requires considerable extra expense, and although it is done in many works, most plants do not consider the expense worth the results, and are inclined to treat all power as general expense rather than departmental.

In a plant driven by shafting and belting, the power consumed cannot be registered or recorded, and the power required only estimated from tests made as often as desired. Although there may

be a heavy draft on the power-house at certain times, when all the machinery is in operation, there are frequently times when but few machines are running and the power required is down, although there is no way of recording it.

It is, therefore, extremely difficult to arrive at the actual power used during a month, and for this reason most plants do not attempt its calculation, and are quite ready to charge its cost off as a whole to general expense. To departmentalize it, means extra expense with no benefit gained—except to engineering science.

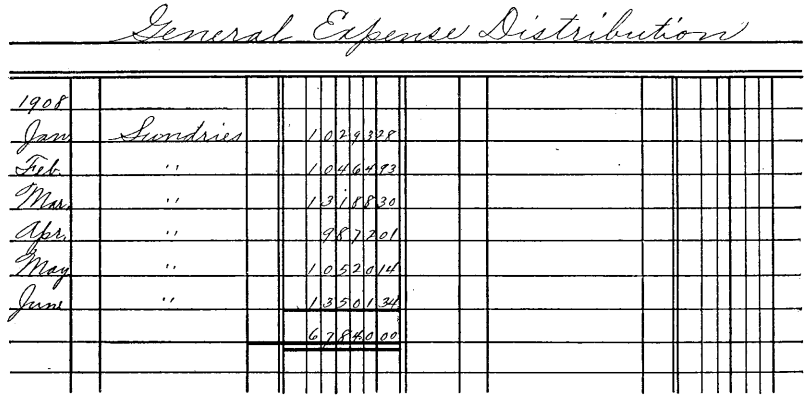


Fig. 3. Expense Distribution Account in Private Ledger

20. Productive Labor and Expense Compared. Having now dissected the pay-rolls and drawn off the departmental and general expense accounts, it is but a matter of bringing these two statements together to produce the final results. It will be remembered that all that is necessary to know is the rate between the two, therefore place them side by side, item for item, as already shown:

	Productive Labor	Expense	% Expense to Prod. Labor
General		$67,840 00	32.6
Department E	$104,409 00	22,731 00	21.8
" F	31,429 00	5,419 00	17.3
" G	5,528 00	2,465 00	44.6
" H	10,659 00	3,174 00	29.8
" I			
" J			
Etc.			26.5
Total	$208,133 21	$122,985 00	59.1

The percentage columns shown give us what may be considered a very close figure as to what are the actual factory conditions of operating expense and productive labor, and the relationship of the former to the latter. These results are all the more reliable because they are based on actual figures taken from the books of the company, thereby eliminating all estimating and the basing of important calculations on guesses and assumptions, which later generally prove to be far from the real facts in the case. The above results, gathered from six months' operation of the plant, are a fair statement of what the same expenses will be found to be in the long run, although if it is desired to go into the matter still deeper, the same tabulation may be made covering a year, with practically the same results.

What do the above figures show?

(a) That the total operating expenses of the plant are 59.1% of its productive labor, of which amount, 32.6%, is necessary to cover the general expenses, and 26.5%, the average for all shop operations.

(b) That the expense of operating the different productive departments vary according to conditions. That while *Department E's* expense is found to be 21.8% of its productive labor, that for *Department F* is found to be but 17.3%; each department having its own rate based on its own actual figures.

(c) Since, as already shown, each department must shoulder its own expense and its share of the general expense, it is seen from results just shown that for every dollar spent on productive work in *Department E*, 21.8 cents must be added to cover its own operating expense, and 32.6 cents as its share of the general plant expense, and that every dollar spent on production here cost $1.544. This has been covered in detail under heading, *True Cost.*

21. How to Use Percentages. Let us continue the use of the same figures. It is apparent that, if to the cost of each productive order worked on in *Department E* during the period of six months just considered—all of which is shown in detail in *Production Ledger No. 2*, the sum total of whose labor cost is $104,409.00—21.8% is added, the amount thus added will be $22,731.00 (the actual figure is a trifle more), which is just the amount of *Department E's* expense shown in the *Private Ledger* and found in detail in *Expense Ledger No. 1.*

Again, if to the cost of each productive order worked on by any and all departments in the plant during this same period—the sum total of whose labor cost is found to be $208,133.21 and which is shown in detail by the individual cost sheets in *Production Ledger No. 2*—32.6% is added, the amount thus added will be $67,840.00 (actual figure is a few dollars more), which is just the amount of total expense shown by the *Distribution Account* in the *Private Ledger.*

It is now a simple proposition. Having found our average ratio of expense to productive labor for each department, and also for general expense covering a period of six months' operations, we can begin to distribute the expenses of succeeding months on the same basis with the same results.

In closing up the *Production Ledger* at the end of each month preparatory to drawing off a monthly summary of all the totals therein to obtain the total cost of production for the month for entry through the journal into the *Private Ledger,* it is simply necessary to enter on each cost-sheet, in columns provided for that particular purpose, two items of expense, one for department expense and one for general expense. In the case of *Department E,* just cited, the expense for the department is to be calculated at 21.8%, and the general expense item at 32.6%.

22. Even Percentages May Be Used. In a large plant with an elaborate system of manufacturing job orders worked on daily with perhaps hundreds of cost-sheets on which an expense calculation must be made, the use of percentages with three figures may require more time in figuring than desirable, in which case an even percentage may be used. Instead of 21.8 for *Department E* use 22, and for general expense, instead of 32.6 use 33. This means that under usual conditions, more expense would be added to production than shown by the expense accounts, and the *Private Ledger* would show whether there had been an over-distribution or an under-distribution in each department's account after the distribution had been made. Turning to *Private Ledger Account, Department E,* while it is shown that, for January, the expense that should have been distributed, if done exactly, would have been $3,697.33 (had the productive labor for the same month been, say, $17,095.45), the amount added to production by using 22% would have been $3,761.00, an over-distribution of $63.67. To adjust this overdraft in figuring the next month,

use 21%, the idea being to have the ledger accounts as nearly balanced out as possible. Should the general expense rate prove more than sufficient when 33% is used, reduce it or increase it to meet the fluctuations of the expense, with the thought always in mind to keep all balances as small as possible, and to make as nearly a perfect distribution as figures will permit.

It is suggested that where these percentages come close to $16\frac{2}{3}$, 20, 25, $33\frac{1}{3}$, etc., that these figures may be used to advantage. By so doing the expense calculations can be figured mentally and very rapidly, and generally without interfering with a satisfactory distribution. If, however, the overlap each month increases, these should be modified to bring closer results.

23. Journal Entry for Distribution. While it is not the intention in the consideration of this subject of *Expense Distribution* to depart therefrom into the general field of cost accounts and cost records, it is assumed that on whatever form of cost-sheet used, provision will be made for the proper recording of the three elements of cost: labor, material, and expense, the latter in two items. Inasmuch as only totals should be carried into the *Private Ledger*, it is only necessary for drawing off the amounts on the individual sheets in *Production Ledger No. 2* to provide summary sheets with sufficient money columns to accommodate, among other credits, all items for each department's expense and also for general expense. This, when done and totaled, will give the total cost of production for the month, made up of the following items:

(a) Labor—amount of which should check total of productive labor shown by the dissection of the monthly pay-roll.
(b) Material—amount of which represents withdrawals from stores during month.
(c) Departmental Expense—each separate, representing the amount of expense actually distributed and thrown into production.
(d) General Expense—representing the total amount actually distributed and absorbed by production.

This done, our journal entry will be:

Debit Production.
(This may be subdivided
into as many accounts as
desired.)

Credit Labor.
Material.

Expense Dept. E
" F
" G
" H
" I
Gen'l Exp. Distribution.

24. Expense Ledger. The totals from the *Expense Ledger* should also be drawn off in a similar manner, and the same items will appear as those shown in the *Production Ledger*, except that no expense will be added, for it will be remembered that the entries in the *Expense Ledger* constitute the very items which are transferred to the *Production Ledger* through the percentage added.

The journal entry for this ledger will be:

Debit Expense Dept. A
" B
" C
" D
" E
" Etc.
Credit Labor.
Material.

25. Results of Distribution. Having posted the journal, turn again to the *Private Ledger* and note what has taken place. It is found that the two items of labor posted have just balanced out the *Labor Account*, and every dollar of pay-roll has been accounted for somewhere, either into expense or into production. It it also found that all the debits in the shop-expense accounts have originated in *Expense Ledger No. 1*, and the credits have originated in the *Production Ledger*. The various subdivisions of general expense have been consolidated in one *Distribution Account*, which has also been disposed of through the *Production Ledger*. What once appeared as an expense cost has now been wiped out, absorbed by production and converted into an asset, just as Mr. Clinton E. Woods, previously quoted, states it should be. A glance at the trial balance reveals scarcely a trace of expense, the small undistributed balances only remaining.

26. Undistributed Balances. Under any method of distributing expense on a *pro-rata* basis, it is apparent there will be small bal-

ances left, representing either an over-distribution or an under-distribution, as already explained. These may be treated in either one of two ways. If the product manufactured has been practically completed during the year, and but little carried over into the next year to be finished, these balances can be charged off and become a part of the *Loss and Gain* account for the year in which they were created, and the new year begun with a "clean score."

If the product, however, consists of large contract work but partially finished when the year closes, the work on same continuing for some time into the new year, these balances may be also carried over to be worked out in succeeding monthly distributions as the work continues. When this latter method is chosen, of course it will be necessary that these balances be taken into consideration when preparing the *Balance Sheet*.

27. In Conclusion. While it is realized that the *Percentage Method* is not perfect in all its details, yet it is quite generally admitted to be the best means that has yet been devised for distributing expenses. A manufacturer using it may be assured that his costs thus figured are correctly shown, from the fact that this method is used and recommended by our highest technical authorities in accounting. From the practical side, it appeals to the manufacturer who is more interested in successful manufacturing than he is in the science of accounts, by the simplicity of the method and economy with which it is operated. The same amount of time spent in planning economies and devising means for cheapening the cost of production that is often spent in lengthy attempts at fine figuring, which, when finished, prove unsatisfactory, will be productive of far better results. Any method which eliminates the unnecessary and simplifies the essentials cannot help but prove attractive both to the successful manufacturer and the progressive accountant.

OPERATING EXPENSE STATEMENTS

28. To properly analyze detailed records, and to be able to extract therefrom the essentials and eliminate all items of minor importance, so that the exact situation and final conclusions can be expressed briefly and in an attractive manner, is an art in itself. A bookkeeper may be ever so well posted in up-to-date methods, and his books may show great care, and be models in appearance, yet

when it comes to preparing an intelligent statement of any feature of the company's business, he may be sadly deficient. It does not necessarily follow that because he can do the one thing well, he can make a success of the other. Even as the pleasure naturally to be derived from a carefully prepared dinner may be completely wrecked by poor service, so can the intent of what would otherwise be an interesting tabulation of statistics be made meaningless by the presentation of a jumbled and carelessly arranged lot of figures.

It is as necessary to clearly show *on paper* the results of the factory operations as it is that they should be correctly recorded on the company's books. While the two operations are entirely distinct and separate, they are closely allied, and every progressive accountant should be interested in both.

The object of a statement is to convey to the reader certain information in an intelligent manner; if it does not do this, it might as well not have been written. This leads us at once to the question: "What constitutes a good statement?"

29. Lengthy Statements Undesirable. That we may have "too much of a good thing," and that even those things worth while may be overdone, is true in the matter of statements. The general tendency seems to be to elaborate rather than simplify, and to crowd into the tabulation a lot of figures representing details which are almost always passed over without examination, or are even hardly looked at. If the same amount of time is spent in studying such a statement that is spent in its preparation, it would not be altogether without value, but the fact remains that it seldom is thus considered.

The size of a company's statement is oftentimes all out of proportion to the size of the business; some of the smaller industries present reports of their operations so voluminous in size as to rival that of the United States Steel Corporation, or that prepared by the actuary of one of the mammoth insurance companies.

It should be remembered that a busy manager is more interested in economical management than in wholesale bookkeeping, and has but little use for a formidable array of figures, except in so far as they show general results. Such a statement, when presented to him, is usually tossed aside to be examined later, while if it were condensed and served up to him in a more attractive form, it would probably

be eagerly examined and studied with interest. A multitude of figures is more apt to confuse than to enlighten the situation, is a waste of an accountant's time, and, being a source of displeasure to the employer, thereby defeats the very object for which it was made.

Detailed records should always be kept, and in such shape as to be immediately available when called for, but it is hardly necessary to incorporate them in a tabulation intended to show results. It will be well, in submitting figures to the manager, to always bear in mind an imaginary notice over his desk: "This is my busy day; be brief." It is safe to say that a good statement should contain as few figures as possible to intelligently show the desired result.

30. Tabulate the Essentials. The data for a good statement should be well chosen. A manufacturer wants results. He is in business for profit making, and wants to know the true condition of his shop operation and the expense, in a concise presentation of facts, and has but little use for comparisons beyond those necessary for showing him the result of his management. He is not often found to be a philanthropist, eager to load down his expense account so that his clerical assistants may use his time to pursue their studies in the science of accounting. He wants to know what his costs of production and the expense of operation are, and where they may be cut, and it is as much to an accountant's interest to show him this in a clear and self-explanatory statement as it is by an elaborate and dazzling array of statistics to show his own ability in handling figures.

A manufacturer will doubtless obtain just as much solid comfort and real pleasure in knowing that special tools recently made have enabled him to clip a few cents off the cost of one of the units of his product, and that economies in his shops have reduced his operating expenses 2% or 3%, as to be furnished the startling information that his *Printing and Stationery* account is .7148% of his *General Expense*, his *Insurance*, 6.2714%, *Postage*, .5218%, *Telephone* and *Telegraph*, .6538%, and so on down the list.

The illustration used is not an imaginary one either. Statements are occasionally seen wherein all the individual items of expense are thus figured and the percentages carried out four decimal places. Of what conceivable use can such figures be? The only imaginable excuse seems to be that the accountant hoped to lower these percentages in the next period—possibly the third and fourth

figures in the decimal—by bringing pressure to bear on the telephone company and on the insurance underwriters sufficient to get the rates reduced, and by telling the mail boy he must use less postage stamps. Rather a peculiar method of cutting expenses, and it is quite safe to say that the same effort applied in other directions would be productive of far more satisfactory results. A good statement, then, should be clear, concise, and complete.

31. What the Statement Should Show. The two elements in a factory, in which the management is directly interested, are the *productive output* and the *operating expense.* The former should be pushed to the utmost limit, while the latter should be trimmed at every point possible; and it is readily seen that the point of greatest efficiency is reached when the plant is producing at its full capacity. A factory with a complete organization is operated at a heavy expense when running at but 50% of its full capacity. These two elements, output and operating expense, are so closely related that a change in one immediately affects the other, and the relationship between the two, which is expressed in a percentage, is either raised or lowered according to the character of the change.

(a) If the operating expense remains stationary and the production increases, or

(b) If the operating expense is lowered and the production remains unchanged, or

(c) If the output increases at a greater rate than the expense increases, or

(d) If the output decreases at a lower rate than does the expense, then the percentage which expresses the ratio of expense to production is lowered, which means increased operating efficiency and a decrease in the cost of production.

On the other hand:

(a) If the operating expense remains stationary and the production decreases, or

(b) If the operating expenses are on the increase while the production remains unchanged, or

(c) If the operating expenses increase faster than the production increases, or

(d) If the operating expense decreases at a less rate than does the productive output, then these tell-tale percentages automatically increase also, which the manager is quick to note, and mean a falling-off in the economy with which the plant is being operated, for increased expense means increased cost of production.

This means, then, in order to be in complete control of his plant, a manager must have production costs and operating expense well in hand, for these two factors are the keys to successful management. It is up to the accountant to show the manager, in figures, the facts as to the true conditions in the shops, and the statement presented to him monthly must be sufficiently explicit to show him at short notice what the expense of operating each department of his plant has been, and what the items were that made it up.

32. Comparative Figures. It is quite unnecessary to demonstrate the value of comparative statements, for this is generally admitted without argument. They portray at once whether what now is, shows an improvement or a falling short over what has been; in fact the degree of success or failure in any line is gauged by comparison with results previously attained.

A statement showing operating conditions with those of a previous period cannot help being interesting as well as instructive; in fact it is from this source that a manager obtains the information which enables him to size up the changing conditions in his plant, and in case of loss in efficiency, shows him where the remedy should be applied.

If a comparison or test is made between the operating expense and productive output, covering a period of, say, six months or a year for each department or process in the plant, as well as for the general expense, the resulting percentages show what the factory conditions will average in the long run. Any departure or deviation from this average in any succeeding month, as shown by the operating statement, serves to indicate to the manager what he may expect as the results of the present period when actual figures are in hand and actual results known. If a falling off in efficiency is noted, opportunity is offered to make economies before it is too late, and for the balance of the period to make a better showing. While it is true that an extraordinary expense, such as a break-down of machinery, may cause an unfavorable showing for a particular month, it is quite essential that this long run average should be closely followed, in order to show that the previous efficiency has again been maintained, or better still, improved upon.

A comparative statement shows at once any radical departure from normal conditions and accepted standards, and is, in reality,

the manager's barometer of factory operating. The discovery that his operating expenses are increasing without a corresponding increase in the output, means that the storm signals are immediately raised, and there are likely to be squalls ahead in the department responsible for the increase, with an explanation in order from its foreman. The operating statement, then, should show up excessive operating expense, what it is, where it is, and what caused it.

33. Source of Data Used. Having now in mind what characteristics should be embodied in the tabulation, proceed to gather the necessary data for the statements.

Continue the original plan and make the *Operating Expense Statement* consistent with the *Percentage Method*, and extract the data for same from the cost records and books of account in a factory where this method is used.

34. Expense Manufacturing Departments. First prepare the shop operating expense statement for the manufacturing departments. If the cost records have been kept in two binders—one for operating expense in *Expense Ledger No. 1*, and the other for production in *Production Ledger No. 2*—the procedure is simple. The *Private Ledger* account for each department shows the total expense for each month posted in total, with all the details shown in *Expense Ledger No. 1*, to which now refer.

Inasmuch as everything is charged to some job number, both labor and material, it is simply a matter of drawing off the job totals, which will check the department total expense as shown in the *Private Ledger*. A convenient grouping of job numbers will be found of great assistance; say

Jobs 1–99. Standing expense orders.
100–999. Special expense orders.

Generally, *Job 1* is used to cover miscellaneous expense costs not covered by other job numbers, and includes *foremen, sub-foremen, clerks, tool-room men, helpers, watchman, small repairs*, etc., both labor and material. In the matter of repairs, it will be noted that such charges originate from two different sources: those done by the department for itself, and those done for the department by another department, and frequently spoken of as *inter-department* work. By providing two cost-sheets for labor items on *Job 1*, one for direct

labor charges, and the other for inter-department labor, the two items may be easily kept separate.

The material on *Job 1* should also be kept in the same manner. The reason for this is apparent, as it shows up at once how much a foreman is charging to his department himself, and how much is being charged to him by other foremen on inter-department work.

Jobs 2, 3, 4, and so on down the list, can cover the various subdivisions of shop expense, such as new small tools, repairs to tools, repairs to machinery, and as many detailed items as may be considered desirable. If expensive repairs are to be made to one of the large machines, it is desirable to keep a separate cost of same by assigning a special job number for the work, say *Job 100,* rather than throw the cost into one of the standing orders, where it is lost. In fact, a limit of cost should be placed on all new tool-costs, or repairs chargeable to standing orders, so that these jobs may not be used as a dumping ground for extensive repairs, which a foreman may be inclined to conceal from the manager's notice, and for which a special permit should be given by the manager, and job number assigned, before such repairs are begun.

The productive labor of the department will be found in *Production Ledger No. 2,* the total of which, if added to the total of the non-productive labor found in *Expense Ledger No. 1,* will equal the total department pay-roll.

The resulting percentage of expense to productive labor expresses the ratio existing between the two, and is used as the basis for distributing the same expense over the various items of production. The question of distributing expense is only referred to here, having been discussed at length elsewhere. Inasmuch as it will be seen that this percentage will fluctuate somewhat each month, it will be well to show on our statement, the same percentage for the previous month for comparative purposes. The extent of the monthly fluctuation is the key to the situation, for these percentages sum up in one figure the actual results of shop management, toward the lowering of which the best energies of the manager are always directed.

For the sake of illustration, take a plant with a weekly pay-roll of about $10,000.00. Having drawn up a form in which the features already discussed have been provided for, extract from the *Expense Ledger* some imaginary figures. The expense accounts

OPERATING EXPENSE DEPARTMENTAL

For month of August 1908 (4 weeks)

Items	Dept. E	Dept. F	Dept. G	Dept. H	Dept. I	Dept. J	Dept. K	Dept. L	Total
Job 1 - Labor direct	21 50 50	42 00 00	24 50 00	5 40 00					
1 - " inter-dept	3 14 50	3 00 00	5 00						
1 - Material direct	3 65 25	13 50 00	2 00 00	1 00 00					
1 - " inter-dept	1 04 75	2 50 00	5 00						
1 - Coal		4 50 00							
2 - New small tools	3 25 40	14 50 00	2 00 00	1 00 00					
3 - Repairs to tools	1 69 60	2 00 00	5 00	1 50 00					
4 - " " machinery	1 25 30	5 00 00		5 00					
100 - Rep. lathes #36	7 41 70								
101 - New tool racks	4 00 00								
102 - Rep. steam hammers		3 7 00							
103 - " drills #11			2 50 00						
104 - Rearranged office				41 00					
Total Expenses for Month	36 80 000	131 20 00	37 50 00	6 21 00					87 91 00
Productive Labor for Month	17 21 1 00	32 84 00	8 72 00	2 26 8 00					33 85 0 00
% Expense to Prod. Labor Aug	21 4	2 4 8	4 3 7	2 8 1					2 6 7
do July	23 9	2 0 1	4 3 4	3 1 4					2 8 3

Non Productive Labor $8507.00 = 24% Departmental Expenses $8791.00 = 25% July " 28.3 Aver. 6 mos 1908 = 36.5%

Productive " 23880.00 = 99% General 10540.00 = 31% " 33.4 " " " = 38.6%

Total Pay Roll for Month $32387.00 Total Expenses for Month 19331.00 = 56% " 61.7 " " " = 59.1%

Fig. 4. Statement of Departmental Operating Expense

of the different producing departments in the plant will appear as shown in Fig. 4.

After studying the same a moment, what will the manager of the plant discover? Among other things he will see at once:

(a) The total expense of operating each department in the works, with the principal items which go to make it up.

(b) That the total productive labor was 79.9% of the total monthly pay-roll while the non-productive was 20.1%; that the former has been apportioned over the various departments and every dollar of same accounted for.

(c) The ratio of expense to productive labor for each department reduced to a percentage, the average of which for all the productive departments is 25.7%.

(d) From the comparative figures, that the August percentage showed an improvement in operating expenses in most of the productive departments over those for July and that they are a trifle lower than the average for the first six months of the year.

(e) That the operating percentage for *Department F* has jumped up 4.7%, which means that something is wrong in that department, and must be investigated.

(f) That for every dollar spent for productive labor, he must add 56.8 cents to cover operating expenses, of which amount, 25.7 cents covers the expense of operating the shops and 31.1 cents covers the general expense of the plant.

The item of *General Expense* = 31.1% is not derived from any figures that appear in this statement, but is taken from the tabulation covering *General Operating Expense* presented later It is desirable to have this appear here, as well as the *Department* average percentage, in order to show the total operating expense (56.8%) on the labor, bringing total plant results on one sheet.

35. General Expense Statement. This statement serves as the companion sheet to the one just shown for *Departmental Expense*, every operating expense appearing on either one of these two statements. It is drawn off in just the same manner as the *Departmental* statement, the total of the various expense accounts in the *Private Ledger* and the details of the four expense departments shown in *Expense Ledger No. 1* checking the total *General Expense Distribution* account shown in the *Private Ledger*. It will be seen at once that the *General Expenses* of the plant may be reduced to the following general divisions:

Special Ledger Accounts:

Executive, Insurance, Taxes, Depreciation, Freight, Express, Cartage, Printing and Stationery, Telephone and Telegraph, Traveling, Postage, Legal, etc.

Department A—Offices:	Clerks and supplies.
Department B—Storehouse:	Clerks, laborers, and supplies.
Department C—Power House:	Engineers, firemen, coal, etc.
Department D—Yard:	Laborers, teams, and supplies.
Unclassified Expense:	Not included in above.

The *General Expense Distribution* account referred to originates by closing monthly all the various ledger accounts listed above into one account. This brings all these scattered expense accounts together in one total, necessary not only for the purpose of distribution, but for convenience in ascertaining and handling general expense. The details can be readily taken from the individual accounts before thus closed, while *Departments A, B, C,* and *D* are carried in detail in the *Expense Ledger.* The total *General Expense* shown then by the statement will check the total shown by the *Distribution* account in the *Private Ledger.*

The form Fig. 5, will be found a very convenient and satisfactory exhibit. Detailed explanation is quite unnecessary; the tabulation explains itself and needs no assistance. The general conclusion arrived at is that the plant's general expense is found for the month of August to be 31.1% of the productive labor; in other words 31.1 cents must be added to every dollar of productive labor to cover its proportion of the general and administration expense of the plant. The same figures are also shown for comparative purposes for the previous month, and also for the first six months of the year; the manager can see at once exactly how the plant is running.

The same summary figures are placed at the bottom of this statement as were shown on the departmental statement, that each may show the final results of the other.

36. Statements for Foremen. It is often asked whether or not it is a good plan to furnish the foremen of the various departments any cost figures. In a good many shops, it is the rule to *tell them nothing* and to keep them in entire ignorance of their expense costs, the feeling being that in case of an unsatisfactory showing they will be inclined to *doctor* their expense returns by diverting them into production in order to make a more favorable showing.

While it is undoubtedly true that a foreman is frequently tempted to resort to such measures—not a very far-sighted policy to be sure, for it is bound to be shown up later—it would seem advisable to furnish him a copy of his operating expenses not only for his informa-

OPERATING EXPENSE GENERAL

For month of August (4 weeks) 1908

Special Accounts		Dept. A - Offices		Dept. D - Yard	
Executive Salaries		General offices		Foremen	
Insurance		Treasurers office		Teams	
Taxes		Purchasing Agents office		Miscellaneous labor	
Depreciation		Timekeepers and O.W.K. counters		" supplies	
Freight		General Foreman and Inspector		Inter dept charges	
Express		Messengers and janitors			
Cartage		Light and heat		Job 50 - Clean up yard	
Printing and Stationery		Printing and stationery		51 - Oper and maintenance yard R&R	
Telephone and Telegraph		Miscellaneous supplies		52 - Rep. yard lighting	
Traveling Expense		Inter-dept charges		Total	1000 00
Postage				**Unclassified**	
Legal					
Water				Fidelity bond	
Advertising					
Total	475 00	Total	250 00	Total	40 00

Dept B-Store		Dept C-Power House		Summary	
Clerks		Engineers		Special Accounts	475 00
Laborers and helpers		Firemen and helpers		Dept A	250 00
Printing and Stationery		Coal		" B	75 00
Miscellaneous supplies		Miscellaneous supplies		" C	150 00
Inter-dept charges		Inter dept charges		" D	100 00
				Unclassified	40 00
Total	75 00	Total	150 00	Total General Expense	1054 00

Non Productive Labor $ 550 00 = 20.1 %
Productive 2188 00 = 79.9 %
Total Pay Roll for Month 2738 00

Departmental Expenses $ 799 1.00 = 25.7 %
General " 1054 00 = 34.1 %
Total Expenses for Month 1933 1.00 = 56.8 %

July % = 28.3 Aver 6 mos 1908 = 26.5 %
" = 33.4 " " " = 32.6 %
" = 61.7 " " " = 59.1 %

Fig. 5. Tabulation of General Operating Expense

September 15, 1908.

Foreman E Department:
(Via Manager.)

The cost of operating your department for the month of August, 1908, was as follows:

Job 1	Labor charged by your department	$2,150.50
1	Labor charged on inter-department orders	319.50
1	Material charged by your department	365.25
1	Material charged on inter-department orders	109.75
2	New small tools	325.40
3	Repairs to tools	169.60
4	Repairs to machinery	125.30
100	Repairs to lathe #36	74.70
101	New tool racks	40.00
	Total expense for month	$3,680.00
	The Productive Labor of your department was	17,211.00
	Percentage of Total Expense to Productive Labor, Aug.	21.4
	Percentage of Total Expense to Productive Labor, July	23.9

Auditor.

Remarks: Manager requests estimate of cost to complete Job 100.

Fig. 6. Statement of Departmental Expense Made to Foremen

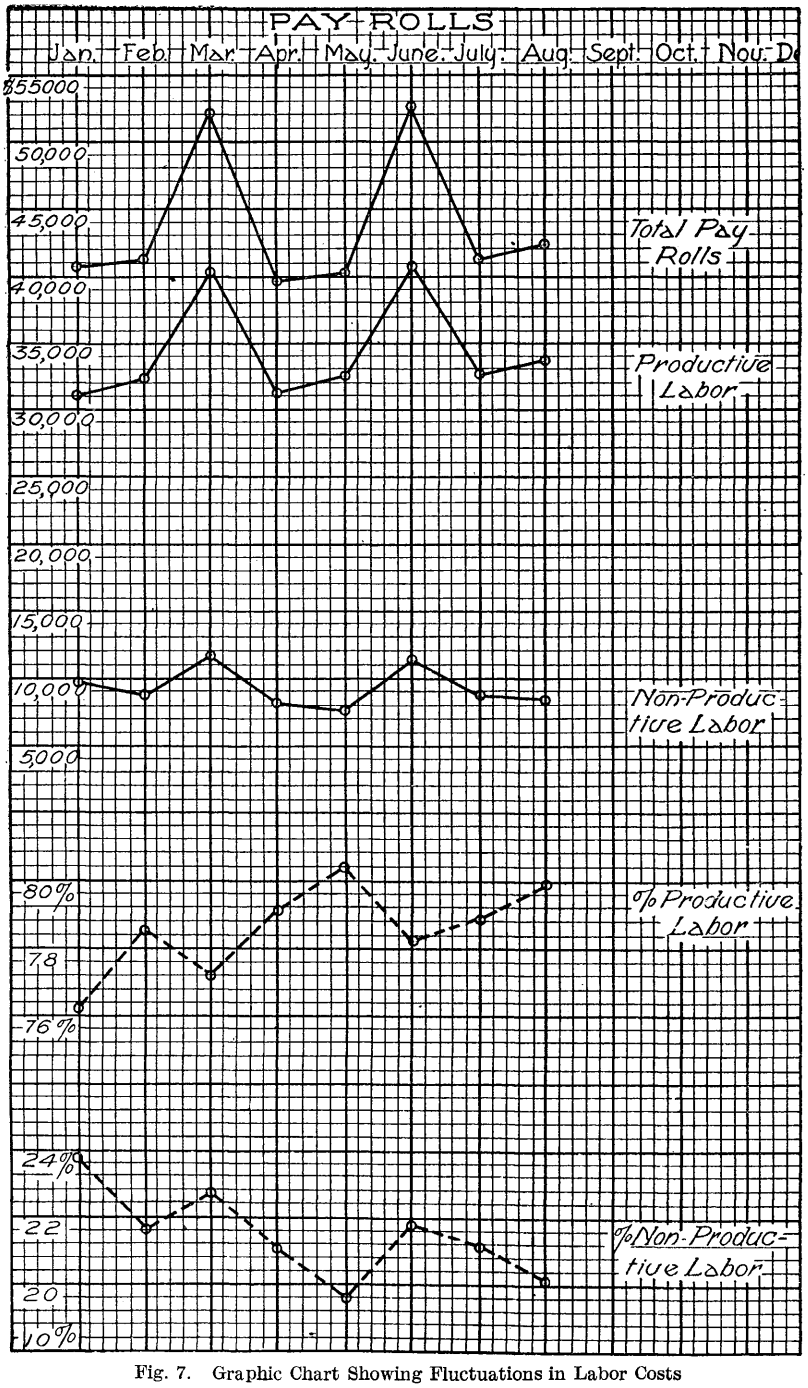


Fig. 7. Graphic Chart Showing Fluctuations in Labor Costs

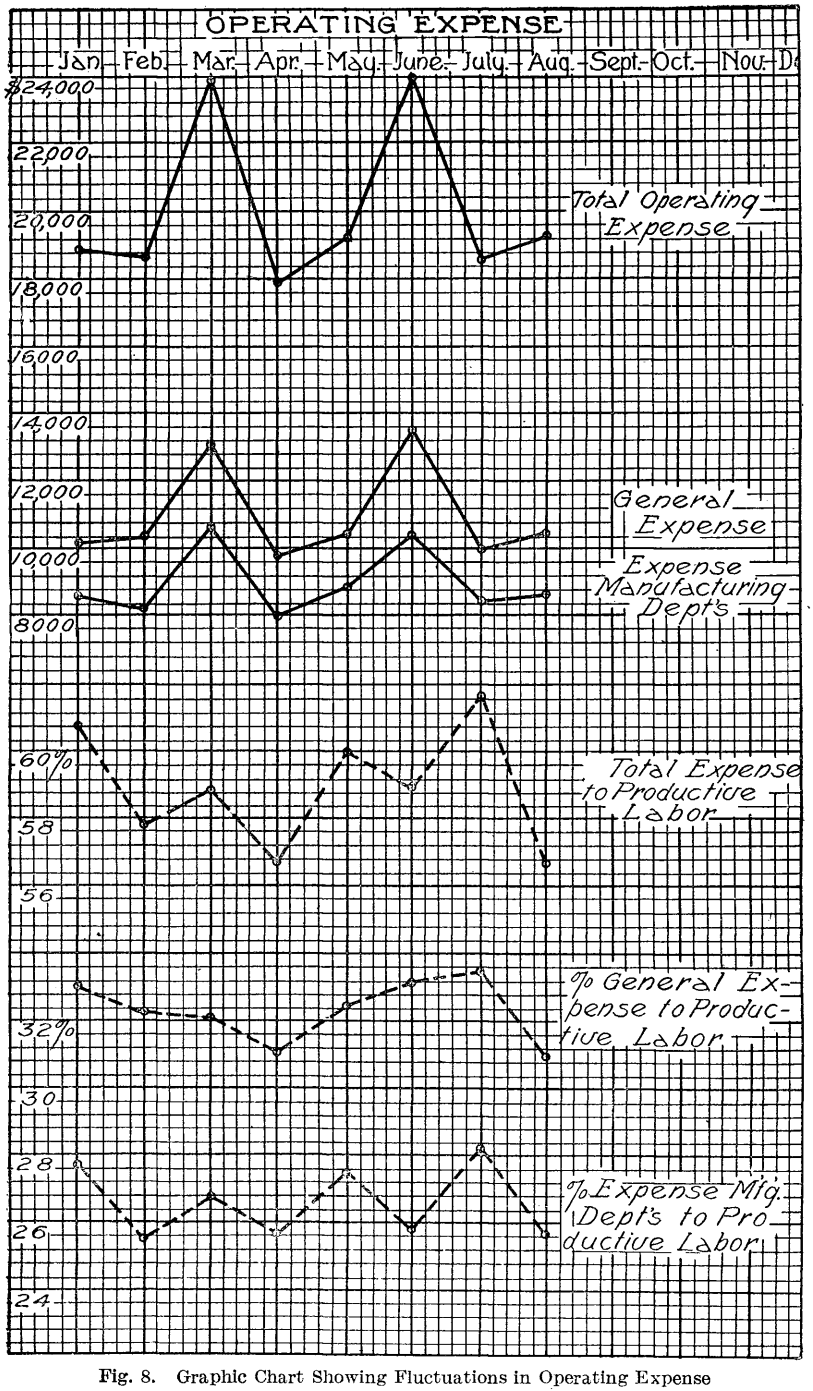


Fig. 8. Graphic Chart Showing Fluctuations in Operating Expense

tion but as an incentive to practice economies on his own initiative without waiting for a *call* from the manager. Most foremen are quick to see that it is for their own interests to do this and to make the best possible showing for their department. It also creates a good-natured rivalry among the various foremen, which tends towards good results in which both foremen and management share.

The statement furnished the foreman is simply a copy of the expense of his department as shown on the *Departmental Expense Statement*, and may be made up substantially as shown on the form herewith presented, Fig. 6.

37. Charts. While the value of chart records is generally admitted, there will probably be no one in the plant who will appreciate this form of presenting figures more than the manager, who, from his mechanical training, will at once grasp the situation as thus presented. The general trend of operations for the whole period is immediately revealed at a mere glance, without any systematic study of the figures involved, and any unusual condition is detected at once.

To show the possibilities of thus arranging comparative statements, two charts, Figs. 7 and 8, are presented, on which are plotted the same results appearing on the tabulated statements already shown, or previously used for the purpose of illustration on Pages 31 and 34.

On one chart is shown the total pay-rolls with split-up of same into productive and non-productive labor, with the percentage of each on the total; the other shows the total expense, also subdivided into shop and general expense, with the resulting percentages of same on the productive labor as shown on the first chart.

38. In Conclusion. While there is no end to the number of statements that can be prepared and that can be elaborated almost indefinitely, it is well to continually bear in mind that the statement which best serves its purpose is the one which conveys the most information in the fewest figures; is not overloaded with unnecessary detail; whose tabulated data is well chosen, and whose make-up is sufficiently attractive to cause it to be read and studied, and not thrown into the waste basket.

COST SUMMARIES

39. Any system of cost records is deficient that does not provide for the tabulation of all items entering into the cost of individual units or jobs, in such form as will permit of the computation of the total of such costs for comparison with records of total manufacturing expenditures. Three elements enter into the cost of the finished product—*material, labor,* and *expense.*

Under the head of material is included the cost of materials of all kinds of which the product is made.

Labor is of two classes, *direct* and *indirect.* Direct labor is that which is applied directly to the manufacture of a given article; indirect labor is that which, while necessary to the operation of a shop or factory, is not applied to specific jobs or the production of individual units. In a manufacturing industry operating a machine shop, the labor of machine operators would be classed as *direct,* while the labor of porters, oilers, and general workers employed in the shop would be classed as *indirect.* The superintendent of the plant, shop foreman, factory clerks, engineers, firemen, and general workers also belong in the indirect classification. For accounting purposes, indirect labor is divided into two classes—shop indirect and general indirect. Shop foremen and general workers employed exclusively in the operation of a single shop are properly classified as *shop indirect,* and their wages are charged against the operation of the shop. The superintendent, factory clerks, and general workers necessary to the operation of the plant, whose time cannot be charged against the operation of any one shop or department, are classified as *general indirect.*

Expense includes all items entering into the cost of the product or the operation of the plant, that are not included in the charge for material and labor. Expense, like labor, is properly divided into *shop expense* and *general expense.* General expense includes the cost of all supplies and miscellaneous items of expense incurred in the operation of the plant, which cannot be charged to individual shops,

Such items as heat, light, building maintenance, taxes, insurance, and depreciation belong in the classification of general expense.

Any classification of expense items that is not made with reference to a specific plant, must be general; items that in one plant must be classed as general expense, are applied in others as shop expense. The item of power costs furnishes an example. In a plant equipped according to modern engineering ideas, with electrical transmission of power and each machine equipped with its own motor, an exact distribution of power costs to individual shops is a simple problem. The total cost of power for a month is divided among the several shops in proportion to the amount used by each, as shown by meters. Even the hourly cost of power for each machine can then be determined. With a shaft- and belt-driven plant the problem of distributing power costs is less simple. When power costs can be distributed accurately to departments, however, it should be done; otherwise such departments as the drafting room will be charged for power when none is used.

COLLECTING COST DATA

40. For the purpose of making the necessary summaries, complete details of all items of cost for each operation must be collected. This data supplies the foundation for all tabulations of cost statistics.

The first step necessary to insure a record of the cost of manufacture of a given article is the entering of a production order, followed by the necessary shop orders, and the orders of the foremen to the workers. The details of these orders are fully described in another section.

When a foreman receives a shop order, his first duty is to ascertain what material will be needed. He then orders this material from the store-room, using a requisition as described in the discussion of systems for the stores department.

On receipt of the material the quantity is checked against the foreman's copy of the requisition, which is then sent to the cost department. In the store-room, the necessary entries are made on the stores records, after which the requisition is sent to the cost department.

When the foreman is ready to assign the work, he issues work orders to his men. As explained in the discussion of labor records,

the usual form for work orders is a time-card. On completion of each job, the men deposit the time-cards in the rack provided for that purpose. These are later sent to the cost department.

In actual practice, it is usually best to have all requisitions and time-cards collected once during each day by a messenger from the cost department. Sometimes, the cards are also filled out in the cost department and delivered to the foreman with his shop order, leaving him to enter only the man's number. When this plan is followed, the cost clerk must be familiar with all of the operations required, and must keep the foreman supplied with work orders to keep the shop employed for at least a day ahead.

The receipt of the requisitions and time-cards supplies the cost department with the necessary data for material and direct labor charges to indvidual jobs. Data for similar charges on account of repairs is secured in the same way.

The character of the records compiled from this data determines the real value of the entire system of cost accounting. If, as is so often the case, the compiling extends no farther than a mere tabulation of costs of individual jobs, it does not reach its full value as a part of the accounting records. Like single-entry bookkeeping, such records are no more than mere memoranda. The full value is reached only when the records of the cost department are made a part of the general accounting system of the business; where controlling accounts absorb all individual items of cost.

41. Material Costs. The compilation of material costs from the requisitions should exhibit the total cost of all material used in the plant and the total cost of material used on each job.

The records intended to exhibit the cost of *all* material issued to the factory should be divided according to classes, following the same classifications as used for material purchase accounts in the general ledger. This is very important as the information secured from such classifications is needed to form the connecting link between the cost and general accounting systems.

The value of the accounting records is greatly enhanced if, in the general ledger, a purchase account is kept for each class of material and supplies. If but one kind of material is used, only one material purchase account is needed, but in a furniture business, for instance, separate accounts should be kept for purchases of lum-

ber and hardware; in a harness manufacturing business, accounts should be kept for harness leather, patent leather, saddle leather, and hardware. The proper classification for any special business will readily suggest itself, but the material should be classified according to its most natural divisions.

The stores records also should be divided according to the same classifications, so that the records of material included in any one purchase account can be checked, without reference to the records of other classes. In the store-room of a harness business, a card or sheet would be used for the record of each item in the hardware stock, while all of these individual records would be filed under the general classification, *hardware*.

This method provides three records, each closely related to the others. In the general ledger, there is a *hardware purchase* account; in the store-room, a detailed record of the hardware stock; in the cost department, a record of all hardware issued to the factory. When the cost department record is brought into the *hardware purchase* account, by a credit through the journal, the balance of this account should show the value of the hardware stock and should agree with the records of the stores department.

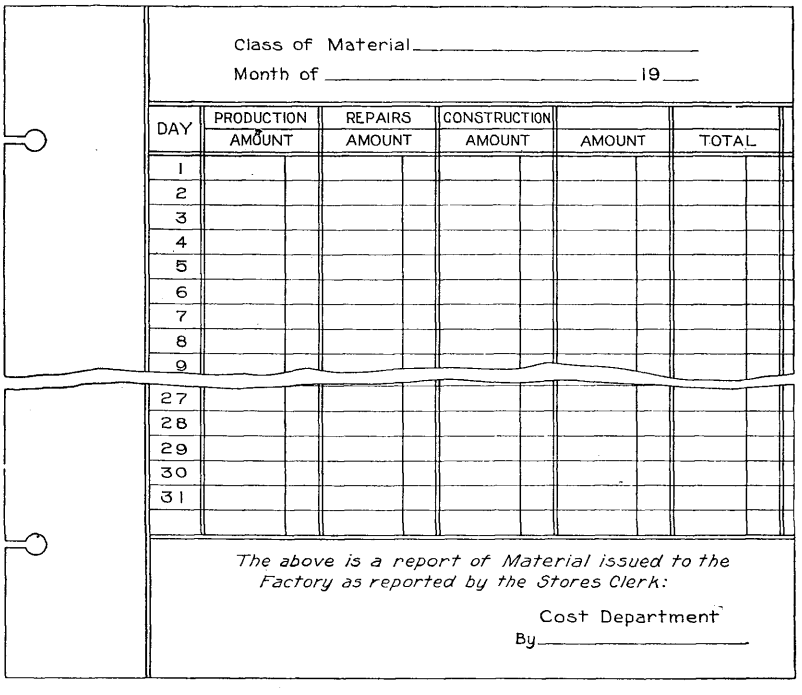
The compilation of supplies costs should be made along similar lines, and the same care should be used in the classifications. Fuel purchases, for instance, should be kept in a separate account, while general factory supplies—as oil, belting, waste, etc.—may be kept in one account or subdivided, depending on the size and nature of the business.

42. Material Cost Reports. The material records of the cost department relating to totals issued should be made in the form of reports, as they will be required in the general accounting office. These reports need not show order numbers, but should show whether used on production, construction, or repair work. The supplies record should show by what department the supplies are used.

Fig. 9 shows a form for a report of material costs. In the heading is given the class of material, being the caption of the purchase account in the general ledger, and the month for which the report is made. The body of the report provides for a daily record of amounts charged to production, repairs, and construction, with an extra column for any special classification that may be needed at any time.

This form is in duplicate, the original being printed on light weight paper to insure perfect carbon copies. A loose-leaf form is most satisfactory because both copies, with carbon paper between, can be kept in a binder and the entries made each day.

Duplicate sheets are used for each material classification. Each day, the amounts are extended on all requisitions. The requisitions are then sorted according to material classifications, those applying



Class of Material_____

Month of _____ 19__

DAY	PRODUCTION AMOUNT	REPAIRS AMOUNT	CONSTRUCTION AMOUNT	AMOUNT	TOTAL
1					
2					
3					
4					
5					
6					
7					
8					
9					
27					
28					
29					
30					
31					

The above is a report of Material issued to the Factory as reported by the Stores Clerk:

Cost Department

By_____

Fig. 9 Monthly Statement of Material Issued

to production, repair, and construction orders being kept separate. Those of each subdivision are footed, preferably on an adding machine, and the total is then entered on the report.

For sorting requisitions, a box or rack, with compartments for the divisions in each class, is most convenient. Such a rack is shown in Fig. 10.

Reports of supplies issued to the factory are handled in the same manner as materials. The form used for this purpose and shown in

Fig. 11, is similar to the material report form, the only difference being that amounts are distributed to the several departments.

At the end of each month, the report forms for material and supplies are footed, the original is sent to the general accounting office, and the duplicate is left in the binder in the cost department. When the cost accounting is handled in the general accounting office, it is not necessary to make these reports in duplicate; this is necessary only when the offices are separated.

43. Labor Costs. From the time-cards or work orders, labor costs are compiled both for separate jobs and to show totals by departments and for the entire plant. The compilation showing totals is made for the purpose of checking the pay-roll—to prove that all labor paid for has been charged to factory operations in some form.

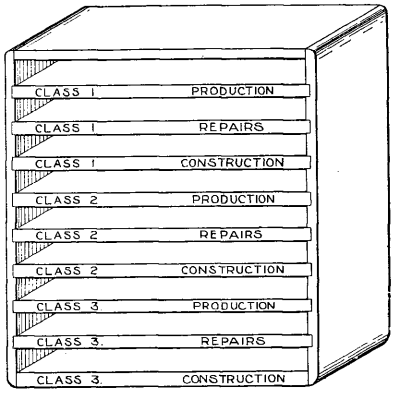


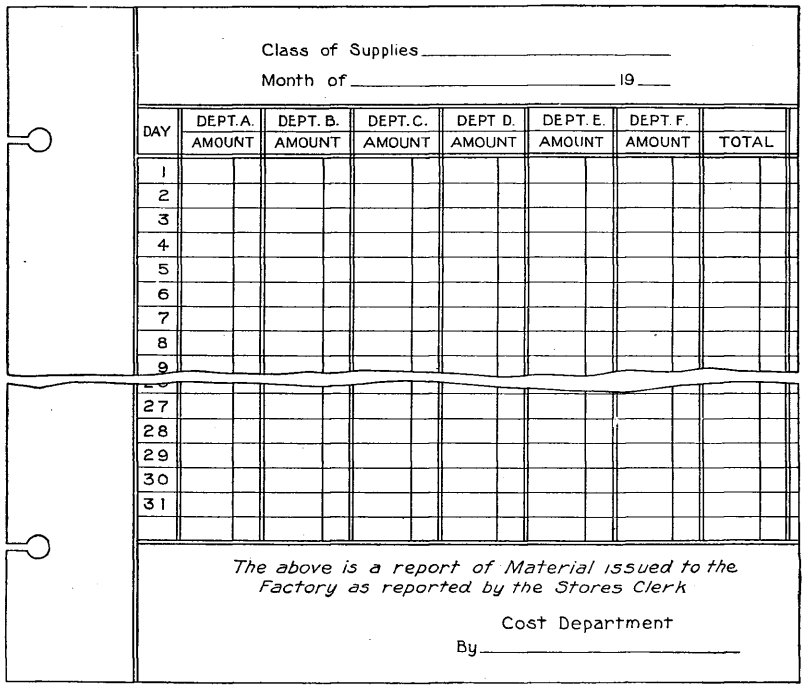
Fig. 10. Rack Used for Sorting Requisitions

The time-cards should first be sorted according to departments, then re-sorted to separate the direct production, indirect production, repair, and construction labor of each department or shop. The cards representing the different classes should be footed on an adding machine, and the department totals compared with the pay-roll records. Daily comparisons should be the positive rule in order that discrepancies may be adjusted while the matter is fresh. On no account should the adjustment of discrepancies be omitted—labor reports from the factory *must* agree with the pay-roll. Cards showing the class of work done must be turned in for *every* man.

The tabulation of labor costs is really made for the purpose of distributon; that labor charges may be distributed to the proper accounts. The nature of the tabulation will, therefore, depend largely on the class of business for which it is to be used. In some lines, costs must be distributed by both departments and classes of labor; in others, by classes of labor only; sometimes, by classes of product—though this will usually be covered in the departmental distribution.

A form intended for the distribution of labor costs in a single department is shown in Fig. 12. This form is in loose leaf and is filed in a binder, the sheets being arranged in numerical or alphabetical order representing the departments. If the cost and general accounting departments are separated, this form should be in duplicate; otherwise, one copy is sufficient.

In the body of the form, distribution columns are provided for the different classes of labor — direct, indirect, repair, and



Class of Supplies _____

Month of _____ 19___

DAY	DEPT. A. AMOUNT	DEPT. B. AMOUNT	DEPT. C. AMOUNT	DEPT D. AMOUNT	DEPT. E. AMOUNT	DEPT. F. AMOUNT	TOTAL
1							
2							
3							
4							
5							
6							
7							
8							
9							
27							
28							
29							
30							
31							

The above is a report of Material issued to the Factory as reported by the Stores Clerk

Cost Department

By _____

Fig. 11. Monthly Statement of Supplies Issued

construction, with a column for any special classification that may be needed.

After comparison with the pay-roll record, the total labor costs are entered daily on this form. At the end of the month, the sheets are footed and originals sent to the general accounting office.

44. Job Costs. When they have served their purpose in compiling total material and labor costs, the material requisitions and time-cards are sorted by job numbers, direct and indirect, repair and

construction cards being kept separate. Where operation costs are desired, the time-cards for direct labor on each order or job number are re-sorted by operation numbers. Totals of material costs for each job, and totals of direct labor costs for each operation and job are obtained, these amounts being the basis on which charges to jobs for the day are made.

The totals of each class, obtained from requisitions and time-cards, must agree with the totals of corresponding classifications on

LABOR DISTRIBUTION

Department _____

Month of _____ 19____

DAY	DIRECT AMOUNT	INDIRECT AMOUNT	REPAIRS AMOUNT	CONSTRUCTION AMOUNT	AMOUNT	TOTAL
1						
2						
3						
4						
5						
6						
7						
8						
26						
27						
28						
29						
30						
31						

The above is a report of the distribution of labor for the _____ Department:

Cost Department

By _____

Fig. 12. Departmental Labor Distribution Sheet

the monthly tabulation of material and labor costs, as in Figs. 9 and 12. Totals of material and direct labor for jobs and operations are next entered on job or operation records, or both. As a rule, it is best to arrange job records so that material and labor costs can be entered daily, no matter how much time is required to finish the job.

Fig. 13 shows a form designed for the assembling of material and labor costs for a single shop or department. For the labor dis-

tribution, as many columns as necessary are provided for the record of costs by operations. In the material column, the kind of material is entered and the amount extended. When the manufacture requires operations in several shops, one of these forms is used for each shop on each production order—that is, a form for each separate shop order. When the job is finished, the costs for all shops are assembled on one form to obtain the total cost of the job.

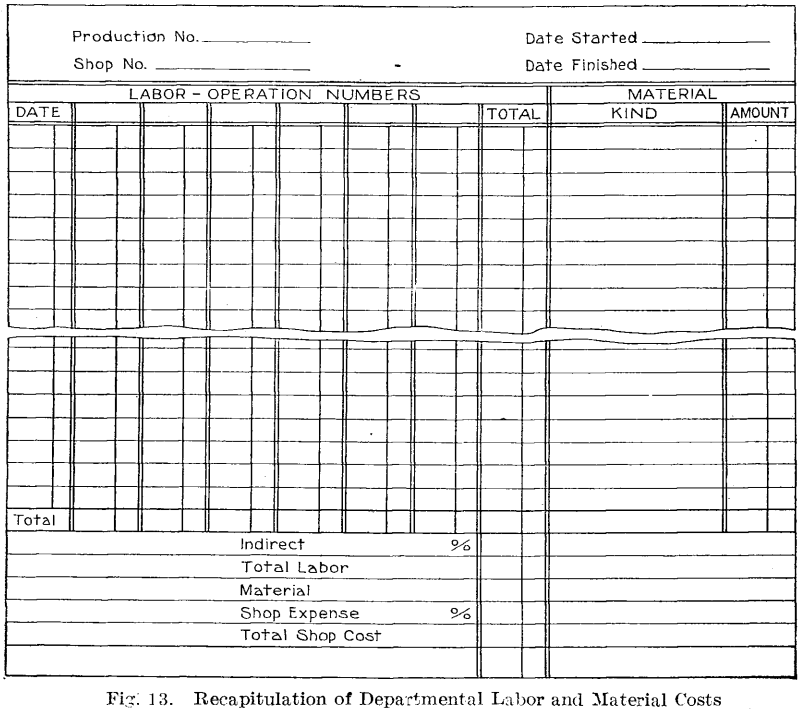


Fig. 13. Recapitulation of Departmental Labor and Material Costs

The total material and direct labor costs are brought down on this form, but indirect labor and shop expense are added as a percentage, as has been described in the discussion of expense distribution. General indirect labor and general expense is added to the combined total of all shop costs. In this connection it may be well to emphasize the importance of distributing every expense possible to individual shops, leaving only those items that cannot be so distributed to be added as general expense. For the ostensible purpose

	Date 19				Date 19				Date 19		
	PREVIOUS	ADDED	TOTAL		PREVIOUS	ADDED	TOTAL		PREVIOUS	ADDED	TOTAL
No				No.				No			
Material				Material				Material			
Direct Labor				Direct Labor				Direct Labor			
Indirect %				Indirect %				Indirect %			
Expense %				Expense %				Expense %			
No.				No.				No.			
Material				Material				Material			
Direct Labor				Direct Labor				Direct Labor			
Indirect %				Indirect %				Indirect %			
Expense %				Expense %				Expense %			
No.				No.				No.			
Material				Material				Material			
Direct Labor				Direct Labor				Direct Labor			
Indirect %				Indirect %				Indirect %			
Expense %				Expense %				Expense %			
No.				No.				No.			
Material				Material				Material			
Direct Labor				Direct Labor				Direct Labor			
Indirect %				Indirect %				Indirect %			
Expense %				Expense %				Expense %			
No.				No.				No.			
Material				Material				Material			
Direct Labor				Direct Labor				Direct Labor			
Indirect %				Indirect %				Indirect %			
Expense %				Expense %				Expense %			

Fig. 14. Boston Ledger Form Adopted for a Continuous Cost Record

of reducing labor, it is the practice of some accountants to throw all expense items into one class, adding the whole as general expense. This is not to be commended, as it results in an unequal distribution. In one shop, the ratio of indirect labor, or of the cost of supplies, to direct labor, may be much higher than in another; the expense for oil, belt lace, waste, etc., is heavy in the machine shop—nothing in the assembling shop. Adding all expense under one head, means that the same per cent is added to direct labor costs in all shops to cover these items; plainly, an unfair charge.

A further reason for distributing expense to shops is, that costs of separate operations are more accurately figured. To reach their greatest value, cost records should reduce costs to the smallest possible unit. Every detail should be shown, and these records should be available for comparison.

Fig. 14 shows how the Boston ledger may be used for a continuous cost record. The regular form is used, five lines being set aside for each job. The first line is for the job number, following which, material, direct labor, indirect labor, and expense are entered. Under each date, the first column contains particulars of previous costs, the second, the costs added for the day, and the third column contains the totals to date. It is not necessary to use the column for previous costs except the first day for which the page is used; daily costs can be added to totals for the previous day.

Several jobs can be recorded on one page and the record can continue until a job is finished. Additions can be made daily, weekly, or even monthly. This form is used to excellent advantage for contracts that cover a long period.

When a large number of small jobs are going through the factory at all times, the labor of the cost department can be reduced and, as a rule, satisfactory results secured, if tabulations of job costs are made when the job is finished. This should not be allowed to interfere with the daily tabulation of total costs, but when requisitions and time-cards have been re-sorted by job numbers, they may be filed by these numbers, in a job rack—new cards being added from day to day until the job is finished. Tabulations can then be made of material costs, showing the quantity and cost of each kind used, and of the labor costs, showing costs by operations or by order numbers.

Each business requires its special form for job cost records. The

form must provide for the information of greatest importance to the business in which it is used. The forms shown herein are submitted as examples for their suggestive value.

Fig. 15 shows a form adapted to many lines. This form is intended for a record of the cost of parts, but could be used for assembled machine costs. Provision is made for detailed labor costs by man, numbers, and kind of work. It will be noted that, after obtaining the actual manufacturing cost—material, labor, and fac-

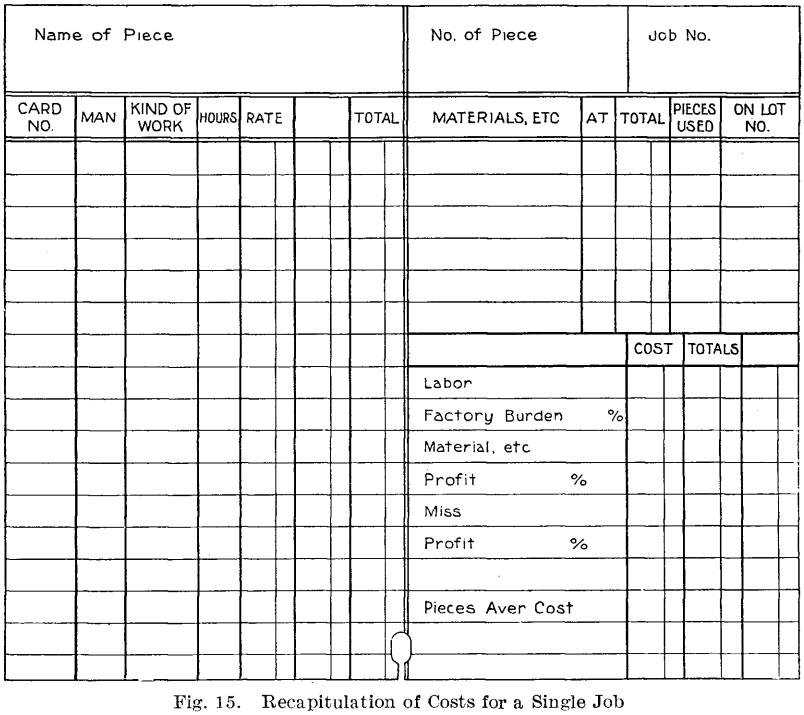


Fig. 15. Recapitulation of Costs for a Single Job

tory burden—profits are added. In our opinion, profits have no place in cost records. To establish a selling price, it is legitimate to add a factory or manufacturing profit before adding a percentage to cover sales expense and a selling profit, but the addition of these percentages has no bearing on the actual manufacturing cost.

Fig. 16 is a representative form for a machine shop. All operations and materials are listed by name, totals only being recorded. Factory expense is added to the labor cost, while a percentage to

cover loss and waste is added to material costs. This form is subject to the criticism that all expense is added as one item—no provision is made for segregating the expense of each shop.

The form shown in Fig. 17 is adapted to a small shop, or for repair jobs. This is the most simple form that could be devised; columns are provided for all essential information, and all items are to be written in.

Name _____ No. _____

SIZE WEIGHT

OPERATION	HRS.	COST	OPERATION	HRS.	COST	MATERIAL	AMOUNT
Molding						Cast Iron	
Cores			Tap-Thread			Malleable Iron	
Grind						Bar Steel	
Turn			Whittle			C.R. Steel	
Drill			Bore			Sheet Steel	
Face			Mark			Angle Steel	
Punch			Rip			Spring Steel	
Bore						Ref. Iron	
Keyseat						Lumber	
Fitting			Dip			Paint	
Build			Paint				
Forge			Stripe				
Bulldozer						Loss and Waste %	
Drop			Assembling			Total Cost of Material	
Trip			Labor Cost			Total Cost of Labor	
			Factory Expense			Total Cost of 100 Pieces	

Fig. 16. Cost Summary for Use of a Machine Shop

45. Comparative Cost Records. The chief value of cost statistics lies in the opportunity offered for comparison. The fact that the last lot of part No. 10 cost $1.17 each, does not, of itself, indicate that the cost is either low or excessive; but if our records show that two previous lots have cost $1.20 and $1.21 each, the comparison reveals the fact that the cost is low.

Valuable as this comparison is, it would be still more valuable if it showed *why* the cost is less. Suppose labor and material costs are segregated. Comparison shows that the reduction of three cents

is made up of one cent material and two cents labor. Now if the quantity and cost of each kind of material used, and the time and cost of each operation are segregated, an analysis will show the exact operations on which the saving has been made. It will be found, perhaps, that the cost of operation No. 10 was actually decreased three cents, but that the cost of No. 16 increased one cent. Why these variations? Was some unusually favorable condition responsible for the saving on No. 10, or can the new cost be maintained?

Job No. Their Order No. Date Ordered

MAN'S NO.	HOURS ON JOB	RATE PER HOUR		MATERIAL	
Total Hours	Shop Burden				
Cost of Material					
Total Cost				Total Cost of Material	

Fig. 17. Cost Summary for Small Shops and Repair Jobs

Can the cost of No. 16 be brought back to the former figure?—these are the questions to be answered by the production engineer. The records of the accountant supply him with the means of comparison—point out both saving and waste. Profiting by the information, the engineer devises ways of approaching more closely to maximum standards of efficiency.

Comparative records should, therefore, provide for a comparison of every item entering into manufacturing cost. Comparisons

COMPARATIVE COST OF PARTS AND OPERATIONS

Part No. _____

	Order No. _____ Date. _____					Order No. _____ Date. _____					Order No. _____ Date. _____					Order No. _____ Date. _____				
OP. NO.	NO. OF PIECES	HRS.	AMOUNT	AVE. LABOR COST	AVE. TIME CONS.	NO. OF PIECES	HRS.	AMOUNT	AVE. LABOR COST	AVE. TIME CONS.	NO. OF PIECES	HRS.	AMOUNT	AVE. LABOR COST	AVE. TIME CONS.	NO. OF PIECES	HRS.	AMOUNT	AVE. LABOR COST	AVE. TIME CONS.
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
28																				
Total Labor Cost																				
Total Burden Cost																				
Total Mat'l Cost																				
GROSS COST																				

Fig. 18. A Comparison of Labor Costs

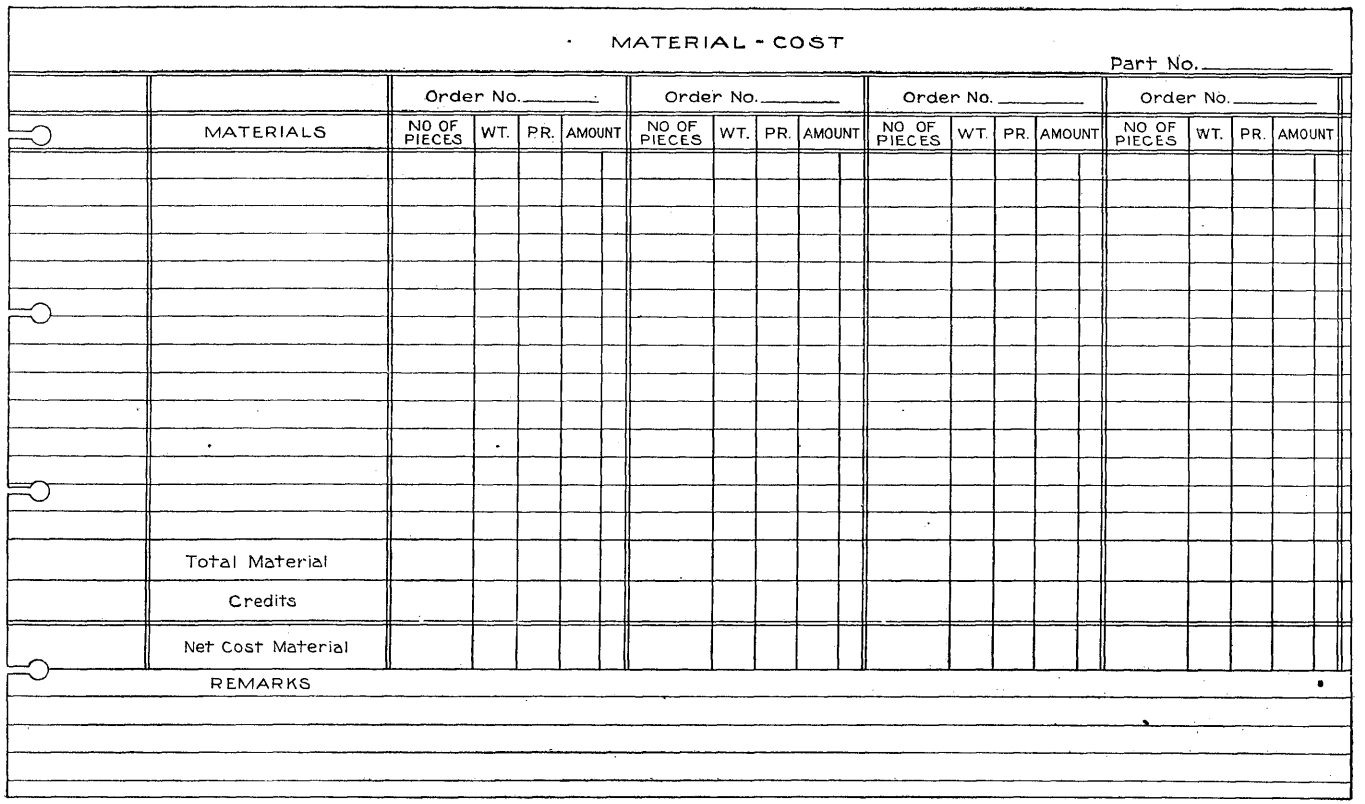


Fig. 19. A Comparative Record of Material Costs

should be based on standard units; if two jobs are to be compared, they must be identical or the comparison is of no particular value. The modern method of manufacturing standard parts makes comparison of practical value. Savings and wastes are more readily located in the manufacture of parts, than in building a complete machine.

Excellent examples of comparative records are shown in Figs. 18 and 19. Fig. 18 provides a detailed comparative record of labor

ITEM												S. O.					
	MAT'L		LABOR		19 ___		MAT'L		LABOR		19 ___		MAT'L		LABOR		19 ___	
April																		
May																		
June																		
July																		
August																		
September																		
October																		
November																		
December																		
January																		
February																		
March																		

Fig. 20. Monthly Comparison of Costs of Standing or Expense Orders

costs, the costs of seven jobs being recorded on each sheet. This shows, for each operation, the number of pieces, hours, amount, average labor cost, and average time consumed. If on three orders, 2,000, 3,000 and 5,000 parts are made, this record will show the total cost of each order, the cost of each part, and by comparison, the relative cost when manufactured in different quantities.

To provide for an analysis of material costs, the form shown in Fig. 19 is used. This is similar to the form shown in Fig. 18, the

difference being that it shows detailed costs of each separate kind of material. Fig. 19 is printed on the reverse of Fig. 18. The form is loose leaf and the sheets are filed in a binder in the order of part numbers.

Fig. 20 is a card form used for a monthly comparison of costs of standing orders or expense orders, with labor and material costs separated. The form provides for a comparison of monthly costs covering a period of four years — a very valuable record. As an illustration of the manner of using this form, it will be supposed that machine shop repairs are made on order No. 460. Both material and labor are included in the cost of repairs. One of these cards would be used for this order and, at the end of each month, the totals of material and labor used on machine-shop repairs would be entered. The total would be extended in the third column.

CONTINUOUS PROCESS FACTORIES

46. A distinct class of manufacture, which involves certain special problems in cost accounting, is the business in which the process is continuous. For convenience, we refer to such factories as *continuous process factories*. Any factory in which a definite quantity of raw material is converted into a finished product, the quantity of the product not being definitely determined in advance, is classed as a continuous process factory. Examples are flour mills, sugar and salt refineries, nail mills, button and pin factories, and yarn mills.

The problem in factories of this class is to find the total cost of production and the total number of units of production; the former divided by the latter will give the cost per unit.

The soct of production includes the cost of material, labor, and expense. It is necessary, therefore, to keep an accurate record of material and supplies issued to the factory, just as is done in factories manufacturing goods on special orders. Labor costs should be recorded by departments, and the distribution of expense should be by departments, as far as possible. Forms similar to those shown in the preceding pages can be used.

43. By-Products. A special problem found in certain industries is to provide for an accounting of salvage, which is either sold in its natural state or manufactured into other products—known as *by-products*. For example, the operation of the cutting room of a

harness factory is a continuous process—sides of leather are cut to produce the largest possible quantity of stock that can be used in the manufacture of harness. The pieces produced vary in size, and it is necessary to figure the cost of cut stock by weight. After this stock has been produced, there remains a certain quantity of scrap leather. This scrap leather is not worth what it originally cost in the sides of leather, but has a certain market value. It should, therefore, be weighed and the value credited against the gross charge for leather to the cutting room.

Now, some manufacturers, instead of selling this scrap as it comes from the cutting tables, convert the best of it into such by-products as heels and washers, selling the residue as scrap. Here is an added manufacturing process—a new department, operated because the price obtained for the by-product makes it profitable. The natural thing to do is to keep accurate cost records for this department, charging the material at scrap prices and take credit for the profits. But some accountants contend that the value of the by-product—less cost of production—should be credited against the material charge to the principal product. Provided the volume and value of the by-product is small, there is no serious objection to this plan, but it is not a safe rule to follow.

In some industries, the value of the by-products is greater than that of the so-called principal product. The large soap factories make glycerine and other by-products of greater value than the soap products. So profitable is this branch of the business that the scrap or residue from the manufacture of soap, is bought from smaller factories, to be used in the manufacture of these by-products. The by-products from the manufacture of gas produces a revenue, in the case of a large gas company, more than sufficient to pay the entire cost of operating the plant. Under these conditions, it is readily seen that the manufacture and sale of by-products should be treated as a distinct branch of the business; otherwise it might easily be shown that the principal product is without cost.

PRODUCTION RECORDS

48. Methods of recording the cost of material and labor used, and of tabulating these costs for individual jobs, have been discussed in the preceding pages. To complete the cost department records,

there should be a record of total production—a record showing the cost of all finished jobs. This information has an important bearing on the general accounting system.

The form of the report of production will naturally vary in different lines of business, though the information needed follows the same lines in all cases. The essential feature is an exact record covering every article manufactured in the factory; and every order for parts must be considered as an order for finished product.

Report of Jobs Finished in _____ Department

Month of _____ 19___

DATE STARTED	ORDER NO.	DATE FINISHED	QUANTITY	COST				REMARKS
				MATERIAL	LABOR	EXPENSE	TOTAL	

Fig. 21. Monthly Recapitulation of Job Costs

Sometimes daily reports of finished orders will be required by the main office, especially when the factory is located at a distance. As a rule, however, a report covering a period of a week or a month will serve the purpose.

A form that is adapted for most industries, and for daily, weekly, or monthly reports, is shown in Fig. 21. In the heading of this form, provision is made for the name of the department. When it is desired to keep separate records of two or more classes of goods made

in the same factory, it is necessary to make a report of each class. The class is usually indicated by the name of the department; when it is not, the name of the class should be substituted. The body of the form records the date started, order number, date finished, quantity, and cost in detail.

The making of this report requires very little additional labor in the cost department. Each day, when costs are tabulated on the finished job cost cards, the details are entered on the report, each job being placed in its proper class. At the end of the week or month, the total column is footed and the report is sent to the general accounting office. If the office and factory are widely separated, the report should be made in duplicate, and a copy retained in the cost department.

CONTROLLING ACCOUNTS

49. Certain controlling accounts are required in the general ledger to complete the connection between the cost and general accounting system—to bind the two together. These controlling accounts, which absorb all of the elements of cost from month to month, furnish the means of proving the accuracy of cost figures; they change the cost system from single entry to double entry.

Two controlling accounts are necessary—*Manufacturing* and *Expense Distribution*. The former finally absorbs the latter and is, therefore, the principal controlling account.

One manufacturing account may represent the entire product of the plant, or there may be several accounts representing different classes of goods, or departments of the business. In machinery manufacture, the foundry is frequently treated as a separate business; in the manufacture of knit underwear, the yarn and knitting mills are operated as separate plants; in a harness factory, separate accounts are kept of the manufacture of harness, collars, and saddles. Each of these divisions, whether departments or kinds of goods, calls for a manufacturing account.

Expense distribution is subdivided in every business having more than one department or shop. The sub-divisions of this account are *General Expense Distribution* and *Shop Expense Distribution*, an account with the latter being kept for each shop.

The sources of charges to manufacturing accounts are reports of material issued to the factory on production orders, Fig. 9, reports of direct and indirect labor employed on production, Fig. 12, and the expense distribution accounts. Credits to manufacturing accounts are derived from reports of finished jobs, as in Fig. 21.

The sources of charges to expense distribution accounts are: reports of material issued to the factory to be used for repairs, Fig. 9, reports of supplies issued, Fig. 11, reports of labor employed on repair jobs, Fig. 12, and the different accounts covering expense items that must be apportioned. A credit to expense distribution account, with a corresponding charge to manufacturing account, closes this account monthly.

50. Controlling Account Entries. The accuracy of the entries to controlling accounts in the general books is of the utmost importance. Upon them depends the proof of accuracy of the cost figures of the cost department on individual jobs.

Material and labor costs are accurately determined. The value of material drawn for all purposes, as shown by the report in Fig. 9, is credited to material purchase accounts, and these accounts are checked against the store-room records. Reports of supplies drawn are handled in the same manner. The labor report, Fig. 12, covers all labor charges and must agree with the pay-roll for the period covered.

In the distribution of expense, however, there are many opportunities for error. While the total expense to be charged against the factory for a given period is accurately determined, the amount is not known until the end of the period. This is represented by the amounts charged to the different expense distribution accounts. In the meantime, to determine the cost of individual jobs, it is necessary to apportion expense on a percentage basis, as explained in the discussion of that subject. Since that ratio for the current period is unknown, it is necessary to assume that the actual ratio for the preceding period still is correct; therefore, that ratio is used in figuring the cost of all jobs. It is only when the expense distribution for the current period is made on the general books and the true ratio determined, that discrepancies, if any, are discovered. Unless the distribution is accurate, the resulting ratio will be incorrect.

Formerly, it was the custom to base the expense ratio on the

actual figure for the preceding year, which meant that changes in expense ratio were not taken into account for an entire year. As a result, the total manufacturing cost shown by the books at the end of the year, did not agree with the costs as figured in the cost department; it was usually much higher.

By operating the controlling accounts, making accurate distributions of expense, the period can be limited to one month. Discrepancies are then quickly discovered and the necessary adjustment made in the expense ratio used. If it is found, at the end of the month that the true ratio of expense is higher or lower than for the preceding month, the percentage to be used for the next month is raised or lowered accordingly. With a careful distribution of the expense items each month, the variations in the ratio should be very slight.

The objection is sometimes made that a monthly distribution of expense is inequitable—that certain expenses may be abnormally high in some months and below the average in others. But with proper controlling accounts, this objection ceases to be serious. Certain expenses are paid in one month that should be distributed over an entire year—as taxes, insurance, and repairs. The amounts charged to the expense distribution accounts each month, are only the amounts that should be apportioned to that month. Taking taxes as an example, one-twelfth of the entire amount should be charged each month.

As an example of adjusting entries for controlling accounts, journal pages are illustrated, in Fig. 21, containing entries made at the end of the month—with explanations. It will be noted that the last entry is a charge to *manufactured goods* account, and a credit to *manufacturing* account of the total cost of finished goods, as shown in the report, Fig. 20.

This account, *manufactured goods*, occupies the same position as a purchase account. It represents the cost of finished goods to the commercial division of the business. To this cost must be added an amount sufficient to cover selling expense and provide a profit, as is done when goods are purchased for re-sale. Selling expense should not be included in the cost department's figures; nothing should be added to the actual cost of manufacture, unless it is desired to add a small amount to provide a factory profit.

May 31st 1909

Shop Expense Distribution-Shop A
  To Repairs
  Supplies Purchases
  Power
  &c
    Shop expenses for month of May

Shop Expense Distribution-Shop B
  To Repairs
  Supplies Purchases
  Power
  &c.
    Shop expenses for month of May

Shop Expense Distribution-Shop C
  To Repairs
  Supplies Purchases
  &c.
    Shop expenses for month of May

General Expense Distribution
  To Taxes
  Insurance
  Labor-Genl Indirect
  Plant Maintenance
  Depreciation
  &c.
    General expense for month of May

Fig. 22. Journal Showing Adjusting Entries

May 31st 1909

Manufacturing Account
To Material Purchased per report
Labor direct " "
Labor indirect " "
Shop Expense distribution - Shop A
do do - Shop B
do do - Shop C
General Expense Distribution
Total manufacturing
expense for month
of May

Manufactured Goods
To Manufacturing Account
Cost of finished
goods per report

Fig. 22. Journal Showing Adjusting Entries

Manufacturing account has been charged for the cost of manufacture—material, labor, and expense—and credited with the cost of finished goods. This does not close the account, however, because all jobs started have not been finished, as there still is work in process. The *balance* of the manufacturing account, then, represents the cost of this work and should agree with an actual inventory of work in process.

No attempt has been made to describe a cost system for a particular business—principles only have been considered in this discussion Proper application of these principles, however, will result in a practical system for any manufacturing business. The exact manner of applying these principles—the detail—depends on the nature of the business; the results desired are the same in all lines. Physical conditions, nature of the product, the policy of the management, the manner in which the business is conducted—all of these factors must be studied and given due consideration in outlining the system. Then the most simple system that will produce results is best, but in the effort to make the system simple, *necessary* details should not be overlooked. It must be remembered that in a comparison of details of cost, increases are more quickly located than if the comparison refers to finished work.

EXAMINATION PAPER

Gen. Expense & Cost Summaries
Questions Nos. 2, 3, 5, 7, 11, 16, 18, 19, 21, 22, 25, 26, 32, 33 and 34 are optional and may be omitted if the student is limited in the matter of time. The omission will not affect his grade as the principles are covered in the other problems in the examination.

GENERAL EXPENSE AND COST SUMMARIES

Read Carefully: Place your name and full address at the head of the paper. Any cheap, light paper like the sample previously sent you may be used. Do not crowd your work, but arrange it neatly and legibly. *Do not copy the answers from the Instruction Paper; use your own words, so that we may be sure that you understand the subject.*

1. Explain the relationship between expense and cost of production and why the former should be absorbed by the latter.

2. Why is manufacturing expense related to cost rather than selling price?

3. Why is the labor cost of production considered the most reliable basis for calculating expense?

4. What is a safe rule to follow in the segregation of pay-roll into productive and non-productive labor?

5. Why is expense not added to operating costs?

6. For a factory with, say, twelve departments or processes, some without any machinery, some with machinery in operation all the time, and others where it is running but part of the time, what means for handling the factory expense would you recommend and why?

7. What do you consider the value of machine rates and where can they be used to advantage?

8. When selling expense is not included in the general expense distribution, how is rate of same arrived at and the selling cost found?

9. Wherein would be the error to carry all the factory operating and general expense in one account and distribute both by one average rate for the entire plant?

10. The trial balance shows a debit balance for *operating expense* Dept. F and a credit balance for Dept. G. What do these balances mean? How should they appear on the balance sheet?

11. The debit balance of *operating expense* Dept. F, at the end of the month, is $100; at the end of the next month it is $200. What does this increase signify and what should be done?

12. The credit balance of *operating expense* Dept. G at the end of the month is $100; at the end of the next month it is $200. What should be done in this case?

13. The trial balance shows but one item of general expense—the *distribution account.* How would you proceed to analyze the various subdivisions of *general expense?*

14. Is a department operated at 50% of its productive labor necessarily operated with any less efficiency than another where the expense is but 25%. Why?

15. The operating statement shows increasing percentages each month. What does this condition of affairs reveal and what two ways are at once suggested for improving the situation?

16. A foreman, to have the operating expense of his department show more favorably, diverts his expense charges onto other work. How can such irregularities generally be detected?

17. A workman's wage is 30 cents per hour in a department whose operating expense is 40% of its productive labor and whose general expense is 33⅓%. How much per hour should the company charge for this man's services on a repair job in order to make a profit of 20%?

18. Calculate the departmental and general expense percentage rates for distribution in a factory whose operating figures are shown as follows:

	Operating Expense	Productive Labor
Dept. A	$2,619.20	$7,342.88
" B	1,234.56	6,439.71
" C	419.06	4,206.83
" D	549.70	1,070.30
Distribution Account	6,088.14	
Total Productive Labor		25,281.49

19. Draw up a form for cost sheet and show thereon the cost of a job done in the above plant whose direct charges are as follows, using the next even percentage in each case:

Labor	Dept. A	$125.10
"	" B	75.20
"	" C	100.30
"	" D	25.40
Material		150.50

20. What method should be used by the cost department to collect data showing material and labor costs?

21. Select a manufacturing business for illustration, name the classes of material used, and state what purchase accounts should be kept. In what respect do these purchase accounts operate as controlling accounts?

22. Illustrate a form of material cost report, suitable for the above business.

23. How are labor costs compiled? Illustrate a suitable form for a departmental distribution of labor costs.

24. How are material and labor costs of jobs compiled? Illustrate a form for a tabulation of job costs in a single shop.

25. What is the advantage of the Boston or tabular ledger for cost records?

26. What are the advantages of comparative cost records?

27. What is a continuous process factory? How is the unit cost obtained in such a factory?

28. How does the manufacture of by-products affect the cost of the regular product of a factory?

29. Illustrate, and explain the use of, a form for a record of total production.

30. What controlling accounts are required to connect the cost system with the general accounting system of the business?

31. How can the cost value of goods in process be determined?

32. In a certain factory, in which the expense distribution is made once in three months, the following represents a record of operations for three months, October–December inclusive:

Inventory material—Oct. 1	$17,500.00
Material issued from store-room	9,000.00
Productive labor, per pay-roll	10,800.00
Indirect labor and factory expense	1,850.00
Material reported on completed jobs	5,000.00
Productive labor reported on completed jobs	6,400.00
Fixed charges for period, including depreciation of machinery	1,250.00

The fixed charges for the preceding three-month period were $1,365.00; the indirect labor and factory expense for the same period was $1,620.00. Estimate the expense ratio for the Oct.–Dec. period. Adjust the difference between estimated and actual expense and show entries on general books.

33. Name the source of debits and credits to these controlling accounts.

34. If the ratio of expense, used in the distribution for the current month, proves inaccurate, how should the discrepancy be adjusted?

35. What is the relationship of the *manufactured goods* account to the commercial branch?

After completing the work, add and sign the following statement:

I hereby certify that the above work is entirely my own.

(Signed)