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# Standard system of cost accounting adapted to the paper and pulp industry

Charles H. Case

American Paper and Pulp Association

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**A STANDARD SYSTEM  
OF  
COST ACCOUNTING**

Adapted to

**The Paper and Pulp Industry**



**CHARLES H. CASE, C. P. A.**  
**Manufacturing Cost Specialist**  
**ROOM 605, 18 EAST FORTY-FIRST STREET**  
**NEW YORK**

**CHARLES H. CASE**  
**CERTIFIED PUBLIC ACCOUNTANT**  
**MANUFACTURING COST SPECIALIST**  
ROOM 605, 18 EAST 41ST STREET  
**NEW YORK**

COST, FINANCIAL AND EFFICIENCY  
SYSTEMS DEVISED AND INSTALLED

IMPARTIAL AUDITS AND  
SPECIAL ACCOUNTING

NEW YORK, July 22, 1914.

MR. H. H. BISHOP, Secretary,  
Wrapping Paper Division,  
American Paper and Pulp Association,  
18 East Forty-first street,

DEAR SIR:—

I desire to state that I have made preliminary examinations and surveys of certain mills among your membership, which were authorized by your Association in their New York meeting on May 26th, and submit herewith results of same, together with the conclusions at which I have arrived, bearing upon the industry in general, in the following more or less detailed report:

In said meeting, which it was my privilege to attend, in briefly outlining what the Association hoped to accomplish along certain lines of activity, you stated that you had shortly before consulted me in Cleveland upon the extremely important subject of manufacturing costs, as it related individually and collectively to your membership, and systematization for the Association calculated to place it upon the highest plane of usefulness to its members.

You informed me that you considered it of first importance for every manufacturing concern to know, for a certainty, their TRUE COSTS, and wished to ascertain if, in the literature of our profession, there was not a cost system upon standard lines or principles applicable to the paper-making industry.

I subsequently ascertained that there was not, according to the facilities at my command, which were unusually extensive, and suggested the procedure which was later acted upon and adopted by your Association in stated session, which was for me to visit, say, four or five mills among your membership, make brief individual surveys of each, and upon conclusion of an exhaustive study and analysis, endeavor to outline the essentials of a TRUE COST SYSTEM for wrapping-paper and specialty mills, and, if possible, suggest a plan of adaptation of periodic reports from same for systematic utilization by the Association's organization, to enable it to render its very best service to its members.

Accordingly, I visited the following plants:

York Haven Paper Company, York Haven and Philadelphia, Pa.,  
The Newton Falls Paper Company, Newton Falls and Watertown,  
N. Y.,  
The Brownville Paper Company, Brownville, N. Y.,  
The Newton Paper Company, Holyoke, Mass.,

and made a careful study and analysis of the entire business of each, especially as pertaining to:

- 1.—Manufacturing Conditions.
- 2.—Efficiency and Management.
- 3.—Cost and Financial Accounting—Methods Employed.
- 4.—Cost Accounting Methods Possible—Their Relation to the Financial Books of Account.

I had also planned to visit the Fletcher Paper Company, Alpena, Mich., prior to my study, which has, of necessity, been prosecuted at New York, but circumstances beyond my control prevented it.

However, I may be able to make that survey later and render them, as I will the others, a confidential detailed report, bearing upon their proposition specifically.

I have prepared my report along the particular lines of my inquiry in such way that I shall use them as enumerated above as headings, employing such headings under them as may suggest themselves to place the matter before you as concisely as possible.

## 1. MANUFACTURING CONDITIONS

While I have made a personal inspection of but the four mills named, and those were necessarily of but a cursory character, I have enjoyed other opportunities of observation, and have been supplied with much valuable data from other mills among members of the Association, so that I feel justified in making the statement that manufacturing conditions in the production of wrapping paper, at least, are generally bad, and altogether there is much room for improvement in certain quarters.

This relates strictly to the productive feature of the business.

### **BASIS OF JUDGMENT:**

Let it be understood also, that my judgment is expressed not from a "Technical" standpoint, but strictly a "Systematization" point of view. I confess I know but little about the actual making of paper, nor is it at all necessary that I should, for present purposes.

I do not pretend to be able to come into your mill and tell you how to improve the quality of your paper, but I do claim I can tell you how you can, in certain instances, change your present methods so that you can produce in a more efficient and economical way.

I have sometimes cut down the pay-roll expenditure of a plant from 10 to 20 per cent., without any decrease in the volume of production or dissatisfaction among workmen, and with little or no technical operative knowledge of the articles manufactured. This is simply because "systematization" is a profession in itself, and requires the same exclusive application as does the successful making of paper.

Doubtless there is no paper mill in existence but that possesses some flaws, and, in the best, an opinionated person could find small, inconsequential things to criticize, but my reference under this heading relates to the broad basis of modern accepted manufacturing conditions.

### **LACK OF CLEANLINESS:**

While the majority of the mills under actual survey were found comparatively clean, the writer is informed that, unfortunately, it is not the RULE, and evidently some managements do not realize the ECONOMY IN CLEANLINESS.

Some years ago the writer was called upon to systematize a metal stamping factory, which was, without doubt, the dirtiest plant he had ever had anything to do with. Accumulations of many years' dirt and rubbish could be seen on every hand, while tools, little and big, were invariably rusted and in a state of neglect, and electric lights had to burn almost all the time, because the natural light from without could not penetrate the grimy windows.

A thorough house-cleaning and simple changes in the manner of work of certain workmen so that the place henceforth could be kept clean, at no additional expense, brought a wonderful change, and actually put hundreds of dollars of savings in the firm's coffers, which had before been irretrievably lost. The management opposed our acting, saying it was all foolish, but early records of gains in production and lessening of expenses after the inauguration of new methods finally gained a grudging acknowledgment of its efficiency. The fact was that the management had, from daily association, become so accustomed to the dirt and filthy conditions as to accept them as a matter of course, never dreaming of the heavy loss in good dollars it was costing them; besides, their organization was transformed from gangs of disgruntled, sour workmen—many of whom were of that foreign element who are said to thrive on dirt—into as willing and enthusiastic a lot of workmen as one would wish to see, and this was owing, in great part, to the new policy of enforced house-cleaning.

It would be well for some mill managements to turn the "searchlight" into their own plants and give CLEANLINESS a trial, then watch for good results. THEY WILL COME.

### LACK OF CONSISTENT ARRANGEMENT:

Like other plants of various lines, no doubt many, if not the majority of mills, commenced with smaller beginnings and added more space and buildings gradually as the need became apparent. In most cases this would be an addition to the Digester House, an enlargement to the Beater or Machine Room, or, perhaps the installation of electricity or steam engines to reinforce water power, etc. At the time of making the additions doubtless much improvement had been felt in the matter of enlarged operations, but oftentimes these changes were effected without giving due consideration to contributing factors, and thus certain awkwardness in arrangements would, unconsciously, be established. Some of the mills, therefore, have features of faulty locations which cause infinitesimal additions to the cost of production that in a year's aggregate would show a considerable loss, could it be adequately determined.

As a practical illustration, a certain mill, producing its own supply of sulphurous acid, many years ago built a substantial shed for the storing of their sulphur and other supplies adjacent to their old digester building; about ten years ago some new buildings were erected more than two hundred yards distant, in which new boilers and tanks were placed, while the old digester plant was dismantled and the building used for other purposes.

The new sulphur-burning ovens were installed in a building yet further distant from the old one, and during that period of time the sulphur and other supplies have been conveyed in barrows over that extended distance, when the sulphur house could have been removed, for but slight expense, to an empty lot adjacent to the ovens, and many a good dollar saved thereby. I am glad to say this change has now been made. It required only the pointing out of the fact to be immediately recognized.

In another mill the chipping machine was set on the side of a large room opposite to the door from which the logs were unloaded from cars. The logs had to be carried over to the chipper, and from thence, after sifting, conducted across the room again and on through the wall to the adjoining digester house. The needless labor and additional power required to operate the extra length of conductor would have been saved long since by a simple rearrangement of the machinery.

I have found but few mills having in their possession a blue-print drawing, rough draft, or plan of their plant. If each management would have one made,

drawn to a scale, with each machine and part of equipment correctly designated in its place so that light tracings of each and every operation can be made upon it, most likely many little inconsistencies in arrangement, not appreciated before, would be discovered, and their elimination will, in many cases, result in a marked saving. To some this may seem unimportant, but it will cost but a slight expenditure in labor to do it, and you might possibly be surprised, in fact, I don't think a single one of your members can afford to overlook this suggestion.

#### WASTE OF ENERGY:

Besides the waste of energy already mentioned incident to faulty arrangement, there are other perceptible wastes because of inefficient movements and mannerisms of workmen.

If the status of paper-manufacturing labor in general may be judged from my present circumscribed observation, I would reiterate that it has reached a decidedly low percentage of efficiency, although it is probably, as a whole, even including the foreign element, above the average in intelligence.

It is a well-known fact that the more intelligent workman is not necessarily the most efficient; indeed, not infrequently his intelligence is exercised in an effort to render the least possible service for his wages. Of course there must, of necessity, be some periods of enforced waiting for certain workmen which cannot be entirely avoided, but, aside from that, there appears to be much unnecessary waste in energy by idling in the average paper mill, or, as it is popularly called, "soldiering."

One occasionally hears of wonderful results obtained by efficiency engineers in large plants where thousands of dollars are saved by the elimination of labor waste, when the volume of production is materially increased with a diminished organization, requiring a much smaller pay-roll expenditure. I have been informed upon several occasions that this could not apply to a paper mill. I do not know how widespread is this impression; it matters not; I must take exception to it. I would not go so far as to say that certain efficiency engineers, so-called, could reduce the cost of production in a paper mill to an amount in excess of their large fees in the course of a year or two, but I do lay claim to the positive belief that introduction of the accepted principles of efficiency by responsible systematizers, or even by the men in authority in the mill's own organization, can effect savings in direct proportion to the insistence and enthusiasm with which they are introduced and maintained.

The principles are very simple, in effect consisting of a constant study of the "motions" of individual workmen by the foremen, sub-foremen, or others in authority. Combined with it is a study of the operation and requirements. It is wonderful how, by the elimination of lost motion, carefully instructing the workman the while, the operation of certain parts of the mill, say the Beater Room, for instance, as well as the Machine Room, can be facilitated and the increase in beaten pulp or product at some other stage of manufacture obtained, or else, a reduction made in the force of workmen required to obtain a given quantity.

A competent machine tender, for example, could drill his force so that every man would have specific duties to perform and when a break in paper occurs, a greater speed in remedy obtained, by cutting out the great amount of lost motion that can now be observed in so many mills, and the result would be smaller quantities of broken stock to go back to the beaters, and, hence, reduction in its percentage and "money in pocket." These things admittedly look small, and they are, but it is in the aggregate of small things that large savings are effected. So many manufacturers overlook that fact. It is the nickel fare that pays the large dividends of street railway companies.

In one mill I came across an ingenious device for the saving of broken stock. A fine wire was stretched across the machine, close to the moving paper, which was attached to a small battery and bell. Immediately upon the breaking of the paper the torn end would wind around the wire sufficiently to furnish the pressure for forming a circuit, and the alarm would ring out. This saved time for the men in getting to their stations to reinstate the paper, and is certainly a step in the right direction. The percentage of "loss of stock" is extremely high in many cases, and that simply means "good money gone wrong," and much of it could be saved by the methods I have mentioned without interference with the regular routine of work. Is it not worthy of a fair trial? To those who put it to the test I shall esteem it a great favor if you acquaint me with the results. That they will prove salutary, I am satisfied from past experience.

## 2. EFFICIENCY AND MANAGEMENT

If the test I have recommended for the elimination of "waste in energy" is assiduously applied, it will doubtless, with but few exceptions, become permanent practice, and it will generally be found expedient to extend it so that monitors, foremen, heads of departments, superintendents, managers, all along the line, will be under the continual friendly surveillance of their immediate superiors.

This is hardly practicable unless certain efficiency records, individual and departmental, are kept, when it becomes quite simple, and soon merely a matter of routine.

Some mills keep various statistical records of time, means, volumes, accomplishments, etc., and they are not without practical value, but comparatively few are kept in such manner as to show CAUSES OF FAULTS and at the same time SUGGEST REMEDIES with a record of the remedial actions applied.

### A SYSTEM OF EFFICIENCY RECORD:

While this comes more or less under the head of "scientific management," and is undoubtedly in the domain of the professional systematizer, each management can exercise their own ingenuity and devise records to be kept in conjunction with the pay-roll record, which will be of considerable aid to them. Usually a card system is employed, ruled with thirty-one lines, and with columnar arrangement so that the clerk who keeps it will have a detailed monthly record on one side of the card for each man in the whole organization. This is not so much additional clerical work as it may appear, and many time-keepers, to whom it is generally allotted, will take his pay-roll data from these cards. On other forms, prepared for the purpose, combinations of these cards are recorded so as to form divisional and departmental records of time consumed, costs and the record of accomplishment in statistical figures of amounts of production. Interesting percentages are thus found and arranged for daily, monthly and yearly comparison. All breakdowns and accidents or unusual happenings are recorded together with full explanations. Percentages of actual efficiency, applying to every part of the plant, can be supplied to the superintendent, managers and others who should be posted.

The value of such an "efficiency system" cannot be overestimated, and its introduction has more than once resulted in a decided change, if not a complete reversal of a management's policy. Any bright clerk who has the opportunity to keep such a system will, by consistent application, soon become a student of economy and make himself very valuable to his employers, for savings of many dollars not otherwise possible can be effected.

### 3. COST AND FINANCIAL ACCOUNTING—METHODS EMPLOYED

While the number of my surveys have been limited, I have been supplied with the forms and descriptions of a number of cost systems by member firms of your Association, all of which I have critically examined and subjected to careful analysis, so that the following statements are based upon a considerable field of investigation.

#### WHY SOME SELLING PRICES ARE CUT:

There are, I find, in some twenty or more wrapping-paper mills various kinds of cost systems, good, bad and indifferent, while one or two that I have examined are libels to the name. The latter are worse than useless, and, in fact, are really DANGEROUS, because they are POSITIVELY MISLEADING. The alleged costs they are supposed to produce are not costs or anything like them, for they represent anything but the true state of affairs.

I am convinced that much of the past idiotic slashing of selling prices has been due, in great part, to the fact that the low quotations were based on ERRONEOUS COSTS.

The firms who were honestly misled by spurious costs, and induced thereby to cut under prevailing market prices, must have suffered severe jolts, to say the least, when at the close of their fiscal periods their old reliable Profit and Loss Accounts told "what was what," and gave the lie to their cost systems, or should have done so did they realize the root of this evil.

I am informed that more than one such firm (in kindness giving them the benefit of the doubt) are now out of business; they practically cut themselves out, and it is no wonder that their cost systems, so-called, proved their undoing.

If they had not been moved by false motives of economy, and had paid a reasonable amount for the installation and maintenance of a *true cost* system, they would have known for a certainty that they could not sell at such ruinously low prices, and would probably have survived.

#### SOME SYSTEMS SIMPLY A COLLECTION OF FORMS:

A system of forms is by no means a cost system. I found a few firms, fortunately only a few, who are content to keep records of several facts and figure presumptive costs from them on a more or less fixed basis.

The merit in this plan seems to consist, in one case, in the fact that the basis adopted was always on broadly conservative lines, but the alleged costs meant nothing whatever, for the principle is wrong. A record of each grade produced is kept in pounds (in one instance in tons and fractions, more or less close) and a scale of proportion figured at the end of the month.

All of the month's expenses, including labor, were added together with the estimated cost of materials. Then the scale was applied and the suppositious cost of each grade determined upon its proportion in pounds of production to the total production. This method is fallacious because the scale as found does not furnish the true incidence for distribution of expense, and it goes without saying that labor cannot be so applied on the various grades. Some paper requires twice the labor of others, and there can be no set scale to govern the application of this important element of cost to the various grades of product, for manufacturing conditions are rarely, if ever, twice alike, so that a tonnage basis could not, under such circumstances, be a criterion. Even in one case where a detailed stock record is kept so that the material charge is not mere guesswork, as in the others, the costs are still wrong as relating to both the labor



and overhead expenses, for I claim it is not the correct incidence for the overhead expense distribution under any circumstances, as I shall endeavor to demonstrate under another caption. A number of cost systems I found to be established generally on right lines, but containing one or more processes of figuration, which, on the surface, present attractive features of plausibility, but when applied to the strong test of analysis are "weighed and found wanting." The result is that the costs produced appear to be accurate and dependable, but, while the errors contained within them are so insidious as to defy detection, they are sufficient to subvert the truth. It is not possible in the present limited space at my command to demonstrate this fact as pertaining to any one of the systems to which it applies. That would require a separate report almost as voluminous as this one, but if you will take the time to analyze your system you can discover for yourself if it applies to you, making sure that the various methods employed in your system are based upon absolute, undisputable facts, and not merely suppositions.

### THE ACCUMULATION OF PRIME COSTS:

A true system of cost finding must be free from all elements of conjecture, and it produces accurate or true costs proportionately as guesswork is eliminated.

There should be no real difficulty in the accumulation of Prime Costs—*i. e.*, the combined cost of material and labor alone—but I have found few that do it correctly, while quite a number could obtain them with the same expenditure of labor they now apply to it so awkwardly, if their cost systems were properly revised.

In the first place, no cost system can be true unless it comprehends an accurate perpetual inventory, or stock record, and the latter should be susceptible to constant proof of accuracy. I have not found in one paper mill a stock record in operation which utilizes the "Minimum System of Verification," a plan in wide use in other lines of industry, which automatically proves the stock on hand and corrects all errors in same, and makes it possible to produce on short notice, at any time, a full inventory of all stock and supplies on hand, requiring very little additional work. The absence of this excellent system was a surprise to me until I found that very few professional systematizers had been engaged to devise and install cost systems for paper mills—the majority, by far, are homemade systems, designed by their own accounting forces, and where outsiders had been brought in, they were always professional accountants. I could not find one instance in which a cost expert, a specialist in that important branch of the profession of accounting, had been employed.

The best cost system I found utilizes certain check-proof methods that keep the stock record within \$1,000 of the physical inventory at the close of their fiscal period. I believe it has never exceeded that amount. Materials and supplies used in manufacture are recorded in various ways, usually upon some estimate basis. As a rule I find this feature has not been accorded the importance it deserves.

The record of labor is generally maintained upon a more or less accurate basis. The best way is to operate this in coordination with the pay-roll record, which is done in some systems. A separate record of labor for cost purposes is very liable to error unless it is proved up with the pay-roll record.

In many cost systems provision has been made for the keeping of actual records, supported by inventories, showing quantities and monetary values of Felts, Wires, Belting, Lubricants and Repair Material of various kinds, used for different purposes. That this is an important procedure is evidenced by the

fact that one mill has effected an annual saving of about \$1,500 in lubricants and \$2,000 in belting, which had been previously lost. Several other mills experienced similar results. One superintendent claimed that his present records, which afforded a close scrutiny on felts and wire screens used, have been so valuable to him that those articles are made to last one-half again as long as before. Ocular observations are all right, but good, pertinent records oftentimes reveal conditions and facts that are lost to the natural eye. If all leakages and wastes were effectually stopped in a mill, its cost of production would be perceptibly lower.

On a tour of inspection with the president of a large paper firm he suddenly made a close inspection of certain screens and discovered a leakage of valuable stock that had been going on for some time. He had had his attention called to certain comparative records his cost system had supplied, so that he was apprised of something wrong that was running up into considerable loss, and his practical knowledge enabled him to locate the trouble and rectify it.

A cost system misses a most important function if it is not designed to produce such illuminative records.

### **THE DISTRIBUTION OF GENERAL AND OVERHEAD EXPENSES:**

The distribution of general and overhead expenses are handled in a variety of ways, and I fear the importance of a correct method is not generally appreciated in the trade.

Certain it is that it has proved the "rock" upon which manufacturers of other lines have been "shipwrecked." In this report an attempt will be made later to thresh out the question of establishment expenditure, and its interconnection with costs, not merely of the output, as a whole, but of some unit of measure of the individual grades, specialties and kindred products.

To many persons who have not given sufficient attention to the matter, such a problem will present itself in the first place as hopeless, and in the second as superfluous, and again as costing too much to establish and maintain. Show a person of this type how he can reduce his pay-roll by \$2,000 a year, and he will listen with respect.

Hint to him that knowledge is power, and that absence of knowledge is weakness, and he will be alarmed, not at his own ignorance, but at the prospect of what he terms "unproductive expenditure." A firm that will spend its money freely on plate glass and mahogany in its offices, often shrinks from the expense of getting to know what is going on in its mill.

Why is this? The true answer is, in all probability, that one is a familiar and conventional item of expenditure, and the other is "something new." One is an obvious and tangible asset, the other an easy subject of criticism for the irate stockholder, who remarks "they have nothing of this kind at so and so's." To spend money to-day for the sake of saving a much larger amount at some future period, even where the certainty is admitted, demands some moral courage, but to spend money for the purpose of raising efficiency, detecting waste, and preventing loss, demands strong judgment and confidence as well. Hence innovations in this respect are made much more slowly than changes in the mills.

In some of the cost systems of wrapping-paper mills that I have examined where an attempt is made to find individual "unit of product" costs, the establishment and general expenses are gathered together into one lump sum and distributed to the various grades and products in a number of ways. First, they are prorated to each paper machine by proportion of inventory values of the machines, by the proportion in width of paper capable of production on each

machine, by the proportion of working hours of each machine, irrespective of inventory values and gauges, by the proportion of weight of pulp consumed by each machine, by the proportion of tonnage produced by each machine to the whole production tonnage, and by other very unique methods. A further distribution of these separate machine figures is then made, usually on the basis of pounds of production, or hours of operation. A few systems apportion the general and overhead expenses by a separation of their sum total to the machines at an arbitrary rate of percentage, based upon no fixed rule in particular, and representing a supposititious relationship formed from an acquaintance with the business, only one of which appeared to be at all consistent when subjected to a searching analysis. Still others use a blanket method of distribution of all material, labor and expense accounts combined, divided by the total pounds of production, and the result purports that every hundred pounds of paper costs so much, irrespective of the grade. It can readily be seen that many of the systems are fallacious and the costs figured incorrect, because of erroneous methods of handling this important element of costs.

What my conclusions are after exhaustive analysis of each one of these and other methods, I shall endeavor to elucidate under the next caption, for there is one, and only one, correct method of distribution which should, by all means, be adopted by the members of your Association as the standard, and thus uniform rates, of such prime importance, will be found. Unless this is done the most important factor, by all means, toward the realization of your aim, to steady the extremely uncertain market of wrapping paper and specialties by intelligent competition, will, I fear, be thwarted.

#### **4. COST ACCOUNTING METHODS POSSIBLE AND THEIR RELATION TO THE FINANCIAL BOOKS OF ACCOUNT**

I have endeavored to present the matter of Cost Accounting as I have found it generally in the wrapping-paper making industry. I trust I have not given the impression that all the cost systems I have examined are deficient; I have been furnished complete records from two, at least, which are first class in all details, and certainly reflect TRUE conditions, while others possess excellent qualities and need only a little revision to transform them into accurate cost-finding and cause-determining vehicles.

#### **FACTS PERTINENT TO PAPER MILL COST SYSTEMATIZATION:**

Prior to taking up this investigation, I had been warned repeatedly that the matter of devising a standard cost system for wrapping-paper mills would prove a most difficult matter, if not really an impossibility, that is, of course, along the lines of the modern "cost-finding and cause-determining" systems of accounting, which have done so much to promote efficiency and lower manufacturing costs in other lines of industry. Frankly, I have not found it so. On the contrary, I am firmly of the opinion that the technical practice and established customs peculiar to your line are such as to yield naturally to systematization, and most valuable benefits may be secured therefrom.

The most surprising thing to me is the apparent fact that paper mill managements have not heretofore sought the services of one of the (extremely few) responsible manufacturing cost specialists and thus equipped their plants with a real money-saving device and the most efficient aid to careful, economical and intelligent management.

Some of the best cost systems I have reviewed have been promulgated in part, if not entirely, by certified public accountants, but in them, as a rule, can be found more or less pronounced tendency toward elaborateness and intricacy.

An important branch of "accountancy," which has but recently been elevated to the dignity of a profession, is "systematization," which, as I said before, is virtually a profession in itself.

All practicing accountants are frequently called upon to devise and install cost accounting systems, and of course, the principles of double-entry bookkeeping—so old that they are supposed to be contemporaneous with algebra (certain it is that they were adapted from the algebraic equation)—are religiously adhered to, thus it frequently transpires that a mass of detail is required to arrive at certain desired results, which in factory accounting is sometimes cumbersome in the extreme.

This awkwardness is merely the result of the fact that the function of all systems is to provide a history, in detail, of the business, and while this is smoothly accomplished in recording the transactions in the general or financial books of account, the operations of the factory are altogether different in character and do not readily yield to the same treatment.

Realizing this, some years ago a small coterie of accountants abandoned the auditing and other branches of practice, and have devoted themselves exclusively to manufacturing cost systematization, and the modern cost and efficiency systems of factory accounting, which have proved so valuable and efficacious, stand as their achievements, of which those operated by the Standard Oil Company, The Steel Corporation, The Ford Company, and others, are splendid examples.

I truly believe it is because no practical cost systematizer has been retained to make a study of the costs of the manufacture of paper, at least I have found evidence of none, and have made wide inquiry to this end, that so many of your homemade cost systems are entire or partial failures (whether recognized as such or not), for it is unreasonable to expect a bookkeeper or other employee connected with the staff of any mill, to understand enough of a profession in which he has had no practical training to devise and install a successful cost system which will find TRUE costs. Even if he should possess some natural qualifications in this direction, it would be unjust to require him to do this exacting work in connection with his regular duties, when, in truth, his entire time, with liberal assistance, should be devoted to it.

It is true I have examined one or two meritorious systems acquired in this way, but they are the exception to the rule, and even in some parts of them the tendency toward elaborateness is evidenced to a marked degree, and only one of them could really pass muster. The keynote of cost systems should be "SIMPLICITY." My experience, extending over fifteen years of exclusive manufacturing cost work, has taught me that TOO MUCH SYSTEM IS SOMETIMES MORE DETRIMENTAL THAN NOT ENOUGH SYSTEM. In my investigation I came at once to the conclusion that the "day basis" for paper mill cost systems would not be practicable, and although forms for the gathering of data for the combined day and night must be used and their information recorded daily for statistical and comparative purposes, the real accumulation of all facts and figures for purely cost purposes would best be accomplished at the end of the month.

It was part of my instructions from your Association to outline, if possible, a practical cost system along such general lines as to admit of the adoption of its principles by all paper mills, thus obtaining that uniformity of methods "so devoutly to be wished," and approaching as near as possible, a standard cost system for the trade. This was no easy job, and it has required a great amount

of painstaking study and analysis (not apparent on the surface) to accomplish and present to you in the following outline.

Be it understood, however, that I can only give the BROAD PRINCIPLES of devices which will apply to every mill, but the manner of application must be different in each case, dependent upon existent conditions and customs peculiar to the individual mill. The record, for instance, for the production of sulphite would not apply to the mill that buys all their sulphite, and of the producers, there would be a decided difference in the application of the system by that mill which utilizes its whole product and the one which makes sulphite both to use and sell.

It is important to state here that the first test of a cost system's accuracy is that it ties up to, or coordinates with, the financial books of account.

Therefore, it is essential that the aggregate cost of production, not alone for the fiscal period, as the majority prove it, but for each month, as shown on the general ledger, should be the exact amount to be distributed over the units of product. I appreciate the fact that to show this will involve the making of changes in the procedure of the majority of present cost systems, but I unhesitatingly recommend the changes and will endeavor to demonstrate the importance of so doing. In fact I will go a step further and state that it is best to make your cost system AN INTEGRAL PART OF YOUR FINANCIAL SYSTEM OF ACCOUNTING, even at the expense of complete revision of the latter, if necessary, for then THE COSTS IN THE AGGREGATE MUST BE CORRECT.

It is a very difficult matter to describe in detail a cost system which will be applicable in principle to a number of plants, so that the lay-mind may readily grasp it. It is obvious that it will contain features that will be superfluous for some mills and will require careful, thoughtful reading to be able to eliminate such portions and retain only such as will apply to the mill in hand.

The following outline has been prepared with great care and can be adopted by any wrapping-paper mill, whether its cellulose is derived from wood, rags or other material.

### **THE PERPETUAL INVENTORY OR STOCK RECORD:**

No cost system can be established upon correct principles unless it has for a basis a continuous record of all materials and supplies received used for manufacturing or other purposes, and the quantity and monetary value of the balance remaining on hand. This requires some work, it is true, but it is well worth it, for aside from the distinct advantage of enabling a management to determine where its business stands at all times, it frequently shows up such wastes in carelessness and extravagance—and sometimes by theft—that putting a stop to them more than compensates for the cost of its introduction and maintenance.

I suppose many who read this will say "Well, that don't apply to our mill," but I have found it to apply very often where it was least expected. Very few managements will tolerate carelessness in their record of "cash transactions"; as a matter of fact, a strict record in itemization of all cash receipts and expenditures is invariably exacted from the bookkeeping or cashier's department, while oftentimes valuable materials, for which the same cash has been disbursed, are allowed to lie around promiscuously while every "Tom, Dick and Harry" is freely privileged to help himself, supposedly, of course, for the requirements of the business.

Is it not important to extend the cash account so as to comprehend that which has been converted into another asset of the business, and which is just as indispensable to the business as the cash itself?

An eminent chemist, who is an authority in the paper-making industry, makes this important statement: "Our experience shows that with the exception of five or ten exceptionally well conducted mills it is easily possible to reduce the lubrication costs of paper mills by at least 50 per cent., and at the same time to secure a higher lubrication efficiency" I thoroughly agree with the statement, as far as I have seen, and unhesitatingly claim that the first step toward effecting this 50 per cent. saving must needs be the establishment of a good stock record. It is best to use a loose-leaf ledger or card system for the purpose, each sheet or card so designed as to accommodate the account of each article or commodity handled.

First a careful physical inventory must be taken and the quantity and monetary value (purchase price) for each item entered in the respective debit columns, together with the date, description and any other information that may be deemed expedient.

Subsequently, all materials and supplies received will be posted to the debit section of the card from the invoice, after the same have been audited and O.K.ed and before the bookkeeper enters the same invoices in his books.

A requisition order system should be established so as to insure the withdrawal of no stock without an accompanying requisition order, signed by the proper authoritative persons and designating, besides the date, quantity and full description of the article and the purpose for which it is to be used.

If no stockroom is maintained, some plan of stock isolation, with the best possible surveillance over it, should be adopted, but so many articles of value are required that no paper mill should be without a stockroom of some kind.

At night, or in the morning, if preferable, the requisition orders are turned into the office by the stockkeeper, or some other person to whom has been delegated the responsibility of keeping the requisition orders and issuing the stock for them.

The man selected for this duty during the night tour can turn them over to the stockkeeper in the morning and the latter then send them to the office, or keep them to turn in with the day's accumulation at night, if that way should be preferable, it depends on what is considered the day's records, the combined "day and night," or the "night and day," for I understand both are used. Each requisition order is then posted to the credit side of the sheet or card account and the balance brought down or deferred until the end of the month, according to the system employed.

The balance of the general ledger material accounts then should agree with the result obtained each month by adding the balances of the inventory card or sheet accounts together, and, if a discrepancy occurs, it should be found as soon as possible, thus the general ledger accounts will control the perpetual inventory record. A summary of all materials and supplies used must be posted in all necessary detail as debits to a monthly journalization sheet. Some means, too, should be adopted whereby the balance shown on each card or sheet can be verified by the actual stock on hand. This is best accomplished by the "Minimum System of Verification," which provides for the placing of a fixed minimum and maximum quantity of stock on each card or sheet. If the stock balance is found to exceed the maximum as stated, the management must be notified, for it would indicate over stocking. When the balance reaches the minimum figure it is a signal for two things: Notification to the purchasing department so the stock may be replenished, and the counting or weighing up of the actual stock on hand to see if it corresponds with the recorded amount. If it does, it is merely checked off as correct, and if not, it is investigated according to the importance of the difference and reported to the cost accountant, so he can make the neces-

sary entry to correct the stock record. By this means a continual physical inventory is being taken with a minimum of labor, for at regular intervals, say every quarter, any stock that has not been checked, is verified also. I have installed this minimum system of verification in many plants with much more extensive and diversified stock items than paper mills require, and I have yet to find one dissatisfied client who abandoned it after giving it a fair trial.

## LABOR RECORDS:

There are a number of methods for the recording of labor, but the best is by the use of the individual time cards. There should be two general divisions, viz: Productive or Direct Labor, which has to do directly with the products made, and Non-Productive or Indirect Labor, which has not, but is of a general character. This distinction is necessary, for the latter, unless it can be charged specifically to one or two particular grades or products, is an overhead expense account and must be treated as such.

Whenever a time-clock is in use and it requires cards which permit of the arrangement, the machine cards can be utilized for individual time cards and, instead of being kept at the clock, are placed in cabinets adjacent to the workmen's stations and deposited in the stand by the clock upon leaving.

The design of the card proper must be left to the systematizer; it would be misleading to take it up here because it would have to be applicable to some one mill.

Suffice it to say the time card must give the name of workman and designate the actual work he was employed upon together with the correct time on the proper day.

Some cost accountants prefer an individual time card for each day and sometimes where an elapsed time recorder is used, a card for each job worked upon, but for a paper mill a weekly card is sufficient and it saves the clogging of files if the cards are kept for some time, as they should be.

I have designed a handy card for the "International Time Recorder," having the "In and Out" record on one side, and the classification of work to jobs or production numbers on the reverse side. In this way each record as to work performed had to check up with the machine record on the other side. The card's arrangement was such that posting for each day could be made to the cost records, and also to the individual efficiency records, which were kept for each workman. If the individual time card is kept separate from the "In and Out" clock record, it should be made out by the workman himself, and supervised by the foreman. The latter should never be required to make out the time cards unless the workman is unable to write. However, in mills where a large proportion of workmen are foreigners, this necessity will add somewhat to the foreman's duties, but it is necessary for the proper records. I do not like as well the method of some mills by which the foremen are required to keep labor sheets or tallies of the specific jobs performed by the workmen under him, but when this is done, it is best to have the foremen's records reviewed and O. K.ed by some superior and a daily check should be made by the time-keeper of these sheets with his own or the clock record. The less this work is divided and when it is contracted to one record, which is perfectly feasible, the less liability to error occurs. I have used both ways and greatly prefer the individual time cards; also I have found all objections to the latter soon dispelled after a change to its favor has been made.

The method employed for the subsequent recording of the time cards or distribution (foremen's) sheets are also various. A daily summary sheet that ties into or corresponds with the pay-roll record is kept. The sheets are either

columnized and admit of a running record or are recapitulated at the end of the month and posted thence to monthly journalization sheets. If the business is extensive, operating two or more machines, a regular account should be kept for productive or direct and one for non-productive or indirect labor, and these accounts should be controlled by the general ledger accounts of labor which develop from the pay-roll vouchers.

## OUTLINE OF A DEPENDABLE COST SYSTEM:

The cost system in its principles and general procedure presented herewith, together with outlines of forms, are the result of much study, analysis and hard work. My object was to devise a system upon absolutely accurate lines and correct principles which, being possible of operation upon the simplest basis and yet capable of enlargement to comprehend unlimited detail and statistical information, could be adopted as the standard, if it meets with the full approval of your members, and thus supply you with *accurate* costs upon a *uniform* basis.

Therefore, the outline submitted herewith is drawn upon the simplest scale, and I sincerely hope its possibilities will be instantly seen, for in my opinion it presents the only TRUE basis for determining paper-making costs by the most practical procedure. A number of cost systems among your members are now being operated on similar principles, or with a few changes can be made to do so, although the methods employed are much different.

The *principles* are the important thing, the procedure of less moment. However, I am sure some of them will recognize features in my proposed system that are far superior to theirs, and will readily adopt them. The methods I have described up to this point denote merely routine. So many cumbersome and incorrect plans for collecting labor and material costs are used that I felt the necessity of expressing opinions formed from years of active experience, and if those important records are at fault, your costs will be threatened despite the accuracy of your cost system's principles.

One of the mills I surveyed did not use the requisition order system, but had adopted a plan which was just as good. Only two men of full responsibility ever have access to their large storeroom which is always kept locked, hence no materials or supplies can be had except from one or the other. It is a strict duty for the one making stock deliveries to immediately enter each item in a book designed for the purpose. At the end of the month all deliveries of stock are summarized, and actual or physical inventories taken of the principal and expensive goods. These are sent into the office where the inventory accounts are kept, and if there should be an error in any account, the stock-keeper would hear of it promptly and run down and locate the error. As every mill operates under conditions peculiar to itself and unlike any other, it is necessary to use good judgment in the adoption of these methods. The proposed system proper, besides the perpetual inventory or stock record cards or loose-leaf sheets already described, an outline of which is given in Form No. 1, will consist of cost sheets for Ground Wood, Sulphite and each paper machine, and a number of individual cost accounts, which I have illustrated by Forms 2, 3, 4 and 5, respectively. These forms are shown on pages following this report.

Of course, if Ground Wood and Sulphite are bought instead of made they would simply be recorded upon the perpetual inventory account (Form 1) and if an enlarged scale of record is desired, there would doubtless be cost sheets for Power, different Repairs, and segregated sheets for each machine with divisions for Beater, Machine and Finishing Departments, with various columns to denote values per hour and ton, per cent. of furnish, etc. It must be remembered that the forms given are merely *suggestions*, containing the *basic principles*, but the



detail required for mills is so widely variant in their demands, that it will require the exercise of a little ingenuity to fill in appropriate details. The forms as they stand, however, can be used in some mills of a single machine capacity, and accurate costs will be the result, but I certainly advise the addition of features pertinent to the mill proposing to adopt them. A large card system can be used, but I think the loose-leaf sheets would be preferable. Journalization sheets, which are merely summary or recapitulation sheets in some convenient form, must be made up at the close of each month for materials and supplies used for manufacturing purposes (in fact all purposes) and for all labor, care being taken to separate the direct labor from the indirect, thereby causing the labor journalization sheet to consist of two general divisions.

It is presumed that the various items of materials and supplies used have been credited to the proper inventory accounts of the stock record and the same item summarized must be posted to its respective cost sheet as debits.

For instance, the cords of spruce chipped up for the digester would be charged to the sulphite cost sheet (Form 3), while, say the month's total of hemlock sent to the grinding mill would be charged on the ground wood cost sheet (Form 2).

Felts, wires and other supplies would be charged to the machine designated upon the requisition order by posting the items direct to the cost sheet for that particular machine. Likewise direct labor would be charged from the labor journalization sheet to the cost sheet designated thereupon. Inasmuch as certain supplies are expensive it is always a good plan to keep a book tab or running record of such articles withdrawn from stock, giving the numbers and other distinguishing marks, so that they can be checked up with the monthly journalization sheets which, combined with the minimum system of verification before explained, insures accuracy and enables a close watch to be kept on them. Much waste in lubricants, belting, wires, felts and other articles can be checked in this way, so that it will more than pay for the small additional labor required.

#### **PROPER OVERHEAD EXPENSE DISTRIBUTION:**

In general expenses and those accounts usually designated as overhead expenses, a different method of procedure is necessary. I have already mentioned some of the various "blanket" methods of distribution in use, which do not altogether tell the truth and frequently cause such discrepancy in costs as to be really misleading when issued as a basis for fixing the selling price of some particular grade or specialty. It is sometimes very hard to convince the manufacturer of the importance of this perplexing element of costs; he is a busy man and has too many important calls upon his time to devote any portion of it to the minutiae of cost accounting. Besides, doesn't he employ a cost accountant? He looks to him for his costs, and if he is "up to his job" he gets them. He accepts the figures purported to be "costs" and uses them accordingly, and when later he pores over his Profit and Loss Account for the fiscal period just ended, he rarely ever attributes the cause of the losses, or profits so much smaller than his reasonable anticipation, to those alleged "costs," but cudgels his brain to find other reasons, and generally gives it up as one of the unsolved mysteries of business. Whereas, if he had taken enough of his valuable time to analyze those costs and the methods used to determine them, or had employed a cost expert to do it for him, he might possibly have spent some good money for remedial purposes, but it probably would have told a far different story than the heart-rending one he had been forced to accept.

And usually the cost accountant is not to blame; he is conscientious in his work and thoroughly believes in his costs, but too often he has not been

drilled into the understanding that *everything*—every commodity or article made—has cost a certain definite amount of money out of pocket to produce, and the object of a cost system is to find that sum and fix it upon the *identical item* which has caused the expenditure, and not necessarily to use the cost system as a handy means for spreading a large expenditure of money along various lines over a certain number of pounds or other measurement of units of product irrespective of their actual incidence.

He may say to himself "Oh, it is such a small matter—it is not important," and let it go at that, and thereby rob his employer of thousands of dollars. I know that term may appear harsh and paradoxical; he may be innocent of the wrong, but wrong there is, for it has frequently developed that **THE LITTLE UNIMPORTANT MATTER HAD RUINED THE BUSINESS.**

I have a case in mind in an interior Ohio town, a business of long honorable standing had made a radical change in their selling prices, based upon costs brought forward by a new cost accountant, which informed them that they had been selling their large steam and gas engines at altogether too high prices and thereby lost much valuable business, and their small engines at too low a figure, so their selling policy was reversed despite the fact of a long profitable career. In two years' time their volume of business had increased five-fold, but the profits did not materialize, and instead great losses accrued so that they were forced to assign, and all because the cost accountant did not think the small feature of overhead distribution at all important and selected an easy way to throw all classes of charge into one common collection of shop expenditure, and then average down the whole in the proportion of wages paid to workmen.

There is only one correct way to distribute the general and overhead expenses of a paper mill which I shall endeavor to outline as briefly as possible. First, it is essential to clear one's mind of any traditions of what is usual or conventional in paper mill cost accounting under the *averaging régime*. It will then become apparent that several of the items of mill charge are naturally connected with the use and employment of property or plant and in the nature of a "Rent Paid" for these. In this category are Rent, Taxes, Insurance on Buildings, Interest, Depreciation on Buildings and other Property. Other items are connected with other factors of production. Power, Water, Steam and Electricity—with the use of same by machines, cost of lighting or heating, with area of floor space usually lighted or heated—in short it is readily seen that a large number of mill charges are by no means general in their real nature, but can be narrowed down to definite points of application.

If a mill buys all its sulphite or ground wood and operates only one or two beaters in close conjunction (or under the same roof) with one paper-making machine, does all the finishing in the same room and buys its power outright, it is a very simple matter to represent actual conditions; all the charge factors, whatever their real point of incidence, press equally on all portions of the work in such a shop, and there is, therefore, no differentiation possible between different portions of the work.

In a mill producing its own sulphite and ground wood, and operating one or more paper-making machines, these factors, on the contrary, do not press equally—power, floor space occupied with its burden of rent, interest, insurance, lighting, etc., interest on capital outlay for machines—all vary as between jobs or production orders. There is no justification for treating such charges as an average if it can possibly be avoided.

I trust I make this clear—it is very difficult to explain, but from a cost accounting standpoint, most important to understand.

A paper mill usually consists of a combination of several "shops." The Ground Wood House, the Digester House, the Beater Room in Divisions, each

paper-making machine and the Finishing Room are all separate "shops." The paper machine with its contributing beater engines and portion of the Finishing Room may combined constitute one "shop," as in the system outlined, but it is much better to differentiate the beater engines, individual paper machines and finishing department as three separate shops if possible, because the contributing causes for variances in paper costs can then be traced to the absolute seat of trouble, and more illuminative operating statistics can be had.

We must first deal with the buildings. All the factors of capital and revenue incident in such buildings are carefully mapped out. The capital invested in land or real estate has first place. To this is added the cost of the building. This must cover the entire property of the business, and to the cost of each building must be allotted its reasonable portion of land value. Having exhausted the capital items of each building they are reduced to floor areas. That is to say, every square foot of floor space not subject to special conditions is considered as representing so much capital outlay. Having determined this the charges incident on the floor space due to this capital outlay are ascertained, then interest, ground rent, if any, taxes, insurance, depreciation on buildings—all are reduced to figures and therefore to so many dollars per square foot of floor area.

So many square feet of floor required for manufacturing purposes, so many dollars per annum out of pocket in consequence—the philosophy is sound, is it not? When this is finished, with any factors peculiar to local circumstances taken into account, we have obtained a pretty close idea of what RENT CHARGE is due to a "shop," for instance, occupying Beater Room, Machine Room and Finishing Room working space of say one thousand square feet, or what "rental" overhead is applicable to the sulphite produced in one month with Digester space of four hundred sixty square feet? Where mills are lighted by electricity with overhead lights, the cost of this is also reduced to a floor area basis. The items will doubtless include: Charges due to capital outlay in leads, switches, lamps and in some cases when the light is generated on the premises, a due proportion of the cost of the generating plant; interest, insurance and depreciation is taken out of these sums, and to the result is added the actual cost of power, of current, carbons, cleaning, etc. Thus we get a "rental" again representing the cost of lighting either one of our little shops, whether it is in a separate building or occupies a given area in a large room. Next, the power problem. The capital sunk in engines, boilers, motors and generators, main shafting and pulleys, are ascertained, and the resulting revenue charge therefrom, to this is added the running expense—fuel, stoking, repairs, etc., reduced to a value per horse-power hour. There is not much difficulty in the broad working out of this figure, but the position of the shops and the various local details make the problem a little troublesome. In some cases the cost of power might not be the same in all parts of a large mill, and there are different aspects to be handled as relating to a combination of water-power; these are problems to be met by best judgment, for no definite rulings are possible. Unless absolutely unavoidable the charge for power should not be merely averaged.

The cost of transmitting power to a distant "shop" might sometimes give rise later to the adoption of more efficient means of transmission and this should of course, show in the charges of that particular shop alone, and not reduce the average cost of power in other places which have nothing to do with the improvement. In some cases, however, the average charge per horse-power hour would meet the case fully.

The shops are now ready for the introduction of machines. The charges due to interest, depreciation and insurance on the value of machines are cal-

culated per annum, and then reduced to a rate per hour, based on the probable number of hours the machine will be in work under normal conditions. Thus if we take the annual work of any machine to be 7,200 hours, and the annual charge for interest, depreciation and insurance to be \$720, this gives an hourly rate for these items of ten cents.

In the foregoing it will be seen that all overhead expenses comprising rent, taxes, insurance, interest and depreciation on buildings and light and heat are reduced to a definite charge per square foot per year. These amounts are further figured to cover each "shop" for each respective month, upon the basis of each month's number of working days, proportioned to the working days of this year. Power is distributed upon the basis of horse-power hours, while interest, depreciation and insurance on machines are based upon an hourly rate and the month's charge determined by multiplying it with the actual working hours of the month, irrespective of shut-downs. The method is to keep separate the factors of production cost, where possible, which on the ordinary methods of averaging mill charges are jumbled up in one common account. Each expense account is thus carefully analyzed to determine the proper incidence. Superintending charges will be proportioned to each "shop" using its number of workmen to the whole as a factor of distribution. When all such overhead accounts are so analyzed and placed upon a monthly basis, the remaining accounts of a general nature are distributed by one of two means—which best apply to the mill in question—either in such proportion as the already apportioned expenses stand toward each other, or upon the basis of percentage of wages paid to the various shops.

Indirect labor, as accumulated from the labor journalization sheet or recapitulation should be handled in this manner also, and is kept separate from the direct labor record for this purpose.

This method in its entirety is by no means intricate and the accounts being more or less fixed in character, a chart carefully drawn will require only minor alterations and serve as a scale for actual expense charges to the different shops. This plan of a collection of shops also presents a good basis for distribution of repairs, belting, lubrication, etc., or such items as are too general to admit of direct charge.

Repairs should ordinarily be spread over longer periods of time than the one month in which they happen to be required. I understand many cost systems omit the account for depreciation as it applies to both buildings and machinery. This is decidedly a mistake, for despite the most careful plans to keep property up to a certain standard, it must needs decrease in value from wear and tear, and obsolescence, and the management that ignores that obvious fact is only *fooling itself*. *A reserve account for depreciation should be set up and a certain amount credited to it each month and charged against the cost of the product.*

This scheme of setting aside a portion of the earnings each month to provide for the purchase of new buildings and equipment when the old ones play out is a wise precautionary measure, and in truth the books of account do not reflect the true conditions of the business unless it is done. The usual view taken of a depreciation rate, among those paper manufacturers who favor the proposition, is that of a fixed percentage, say, 5%, on a gradually lessening value. The best method, however, is to divide the number of days figured as the guaranteed life of a machine and estimated life of a building (kept in a good state of repair) at the time of purchase, into its purchase price and thereby find the rate of depreciation per day (operative day in case of machine). The number of days of actual service is multiplied by this rate and the result deducted from the purchase price to determine present value. This amount is then set up in the

ledger account and depreciation charged into costs thenceforth by multiplying the working days of the month for machine and calendar days for buildings by the daily rate.

This, then, is the general plan by which overhead and general expenses are apportioned to the machines or different departments of the business, as designated by the individual "shops." They are carefully drawn up each month from a report rendered by the bookkeeping department and its own cumulative data, on a journalization sheet designed for the purpose and somewhat similar to the journalization sheets for material and supplies and labor. A power cost sheet showing the items charged against power—such as fuel—lubricants and waste, repairs, removing ashes, wages of engineer and firemen, etc., ought really to be kept. I suppose there is hardly a mill in which the evaporative efficiency of the boilers is not known—if not, it certainly should be ascertained either by carrying out elaborate boiler trials or by the better method of keeping records showing the exact amount of coal used per month and readings from a meter showing the number of gallons of water evaporated per month in the boilers, with a deduction for the amount of water and consequent loss of heat in the blow-off water, which also can be arrived at by measuring. If, for instance, the evaporative efficiency of the coal used is equal to, say ten pounds of water to one pound of coal, and it is ascertained by indicating the engine that each horse-power necessitates the usage of twenty pounds weight of steam, it is seen that each indicated horse-power would necessitate the burning of just two pounds of coal. Having the price of coal delivered at the mill, it is easy to arrive at the fuel cost per horse-power hour.

With this as a basis, together with the indicated horse-power of each machine—in which record, be it remembered, the percentage of power consumed in overcoming the friction of the engine and shafting must not be overlooked—the complete cost of power per horse-power hour is figured out upon the power cost sheet.

Of course there are technical points in the power problem such as the superheating of steam to a sufficient extent to prevent condensation in the steam pipe, etc., which are taken as granted in the above example.

This completes my explanation of the only proper and true method of general and overhead expense distribution, and I trust it has been presented sufficiently clear for the lay-mind to see that it is the only accurate and correct method that can possibly procure true costs.

It is not a theoretical discussion, for these self-same principles have been put into practice a great number of times and have never, to my knowledge, when operated right, failed of their intended object.

I have taken out a number of cost systems in which were employed principles that were similar to those now used in a number of wrapping-paper mills, which I described under a former caption, and which were supposed to produce true costs, and set up the costs derived from my system against the same alleged costs, figured according to the former methods, and the contrast was frequently most startling, so that my clients appreciated the danger from which they had been extricated.

Invariably it was found that they had been selling certain products at prices below actual cost, and I hazard the guess that not a few paper mills are suffering similar losses and are supinely unconscious of the fact.

#### **COMPLETING THE COST SHEETS:**

When all the items have been posted from the various journalization sheets to their proper places on the cost sheets, the latter are figured up, completed, and the results obtained finally posted to the individual cost accounts (Form 5).

To the Ground Wood and Sulphite Cost sheets (Form 2 and 3) are posted the kind, quantity, amount, etc., of the commodities made, from the production records of same, which I understand all mills keep.

The columns are then added, the footing of each division carried to the total cost column, and it in turn footed.

With the footing of the quantity column of the product made, the cost per unit desired (cwt. or ton) is found and entered. Any other illuminative statistics relating to the manufacturing of these products can be incorporated in this form and make it that much more valuable. The columns shown in all these forms are intended to show only the *basic principles* involved—no elaboration is possible at this time.

The journalization sheets should properly be kept in a substantial loose-leaf binder and sheets employed for miscellaneous journal entries inserted. From the machine record a journal entry must be prepared showing the amounts of sulphite and ground wood used during the month, the totals of which will be credited to the respective Ground Wood and Sulphite Cost Sheets (Forms 2 and 3) and charged to the proper Paper Cost Sheet (Form 4), for each paper-making machine.

Recapitulations or Summaries must be prepared from the Machine Tender's daily reports, so as to show the weights, time required for the making of each grade of paper, or kindred product produced and such other data as may be desired, together with the "brokes" produced.

The items are then posted to the "Grades Produced" section of each paper machine's "Paper Cost" Sheets. Much care must be taken with this work and the accountant who performs it should satisfy himself that the total of time reported for the various grades of paper or products is correct and corresponds precisely with the operation time reported from a different source for all machines, if such a record is kept.

The Form No. 4 as shown can be enlarged upon to almost any desirable extent, and can be designed with separate columns calculated to show such statistics as the per cent. of furnish, the pounds per hour, etc.—each mill management will have different requirements in this connection—and these Cost Sheets can be made to afford the greatest aid in the study of economics. The sheet is now ready for completion, every entry pertaining to it having been made. Each section of this cost column headed "Amount" is footed and the sum transferred to the "Total" column. This column in turn is footed, the "brokes" produced deducted, and the Total Net brought down. This latter figure is divided by the "Hours" column and a definite cost per hour found. It is then simply a case of multiplication by the time shown opposite the grade to determine the conversion cost of same. The cost of each grade of paper or kindred product is thus found in a lump sum; it is obvious that the form can easily be arranged to show the material, labor and expense cost of each item; it is a mere matter of additional detail. And if the mill possessed facilities whereby the actual record of material going into each grade is kept a better degree of accuracy might be obtained, but the present method will produce costs so near to accuracy as to be absolutely dependable. Besides it is extremely doubtful if an absolutely accurate record of the materials specifically used for each grade of wrapping paper produced can be had unless just one or two grades are manufactured.

A file of these cost sheets, one for each month, will afford some interesting comparisons and bring to light many of the little leakages that are ever cropping out, and their intelligent use will certainly tend to keep costs from mounting.

Finally, each item of production is posted to its individual cost account (Form 5).

These cost accounts contain a continuous record of the specific grade or product. A journalization sheet is then made up from the shipping record, consisting of a detailed schedule of the month's sales, giving the date, customer's name and quantity of product, but not the selling price, in some such form as the following:

Cost of Sales, Dr. \$44,162.20 to Sundries, Cr.

Date	Customer	Product	Quantity	Cost
May 1	Jones & Smith	102 Manila	58-032	\$1,974.44
2	Duplex Co.	100 Natural	10-216	385.32
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
				\$44,612.20

The costs will be entered on the journalization sheet when the account is found and will then be posted to the credit side of the account (Form 5).

When all items of cost have been entered (and posted) they are footed and the sum total entered as the cost of sales for the month, which in reality it is.

This then will be posted to the debit column of a "Cost of Sales" account (Form 5).

This finally completes the cost records for the month, and the cost accountant is prepared to make up his monthly report which consists of copies of the cost sheets (Forms 2, 3, and 4) conveniently arranged by any capable accountant. These cost reports can be in full or partial detail and carry with them valuable statistics, comparisons and percentages, and in connection with the Income and Profit and Loss Statement will prove so valuable that I am positive the thought will oftentimes be expressed—as it has in the past when I have established similar records for other lines of industry—how did they ever get along without it?

These cost reports will tie in with the bookkeeper's monthly statement and represent a part of his exhibits in support of same.

## THE FINANCIAL ACCOUNTING SYSTEM:

No matter what system of bookkeeping is employed it should be so arranged as to afford proof of the cost system's accuracy in the aggregate and thus tie into or co-ordinate with it. Decidedly the best plan is to operate the cost system in the manner I shall outline. The monthly report (Form 6) cannot be made out consistently unless this state of harmony or co-ordination between the systems exists. It matters not particularly what books are used—certain general ledger accounts are set up by means of journal entries, but, of course, a practical accountant can recognize the fact that special books of entry can be used—or a revision of arrangement made so as to facilitate the bookkeeping details.

Of course all cash transactions and other matters relative to personal accounts will have no bearing on the matter, as it concerns only the accounts received for the manufacturing or production end of the business. There must be an interchange of reports between the two systems. The bookkeeping department must render to the cost department a report of all expenses pertaining to the mill, first the fixed overhead charges (with prompt notification of any change in them that happens to occur) and then the current operating expenses, such as freight, express, general expense, telephone and telegrams, etc., as they accrue.

On the other hand the cost department must render the bookkeeping department at the month's end:

- A schedule of materials and supplies used.
- A report of the addition of perpetual inventory accounts.
- Schedule of Sulphite and Ground Wood made and delivered.
- A report of the month's cost of sales.
- The cost section of the monthly report.
- Amount of pay-roll expenditures overlapping, if any.

Invoices for all purchases will be entered in the customary way after the cost accountant has made entries of same on the perpetual inventory accounts.

The general ledger's "material" accounts having been opened upon the same physical inventory figures that have opened the perpetual inventory cards or sheets, and all invoices having been charged to the debit of, and the "schedule of materials and supplies used" credited to the general ledger "material" accounts—whatever their name or names—the balance of said account must correspond with the addition of balances of the perpetual inventory accounts of the cost system. Hence the bookkeeper should make sure the general ledger "material" control accounts correspond with the inventory or stock record and, if not, locate errors and make corrections. This feature, by the way, forces the entry of all invoices, for the "cut-off" must be the same.

In instances where stock is received and used while the invoice has not yet appeared, the cost accountant must issue a memorandum of the goods in duplicate for uniform entry by both which must be later attached to the invoice.

All corrections in invoices, rebates, allowances and changes of any kind must be reported from one to the other and absolute co-operation must ever exist between them. Usually the pay-roll, or a copy of same is filed in the bookkeeping department, and this must contain a summary of the labor charges identical with the cost department "Labor Journalization" sheet—at least the arrangement must be such that a summary for the month, identical in every respect, is readily available for the bookkeeper. It is a good idea for the cost department to render a report of this summary—a replica of the labor journalization sheet—to the bookkeeping department and this, of course, must be done if the pay-roll record is not filed with the bookkeeper.

I do not know of any mills that have overlapping payrolls, *i.e.*, that have wages of workmen owing which do not show on their records. I understand most of the mills pay weekly and end their month on the last pay-day. In that case, for instance, they would close their June business on the twenty-seventh, while if the thirtieth were used there would be two additional working days unaccounted for, which the cost department would have to report to the bookkeeping department with proper amounts and distribution so that it could be charged to the pay-roll or labor account in the general ledger and credited to the "Labor Payable Record," which latter would be closed by the next pay-roll entry. Of course the bookkeeping department would naturally have all the expense accounts and from the inventory records and monthly reports from the cost departments, could easily maintain the Ground Wood and Sulphite accounts which would be similar to the coal or fuel account, which is reported from the schedule of materials and supplies used. Unless the original books were arranged especially for the purpose, a journal entry would be made out debiting a control account, designated as Manufacturing Account, Production Account, Mill Account, or some such name, with the materials and supplies used, the pay-roll or labor account in full, the ground wood and sulphite used as reported, and the general and overhead expense items applicable to the month and crediting the material pay-roll, ground wood, sulphite accounts, and each individual



expense account, respectively. Another entry would debit the sales at manufacturing cost values to a "Cost of Sales" account. The beauty of this arrangement must be apparent.

Then the general books would require another and final journal entry charging the cost of sales and the administration and billing expense accounts to the Income and Profit and Loss Account and crediting the said accounts. Thus the books would be closed and the results of the business accurately shown. An auxiliary record should, by all means, be kept by the bookkeeper showing individual accounts with the actual net profit realized or the net loss suffered for each grade of paper or kindred products made and sold, which must correspond in the aggregate to the Profit and Loss Account. I apprehend some managements will not deem this feature of such great importance as to insist upon it, but would be satisfied to include the selling and administrative expenses with the general and overhead expenses, but this is a great mistake and will serve to defeat one of the most important benefits to be derived from the system. Armed with the knowledge these separate Profit and Loss Accounts furnish a careful management will undoubtedly change their selling programmes in one or more particulars, and I have known it more than once to instigate a radical change in the policies of a business. One of my clients very reluctantly gave their consent for the establishment of such a record because in their case it meant an additional salary. The system soon disclosed the fact that they were losing from \$6.00 to \$10.00 on every steel wagon they placed on the market, while their despised steel wheels were yielding 140% gross profit. They stopped selling wagons, exploited their wheels and have paid large dividends since regularly—something they had never been able to do before the system's advent.

Besides, if you ever succeed in obtaining uniform costs for your members, the *manufacturing* cost must be kept separate from the *selling* costs—that is imperative. These individual accounts would show the inventory at the beginning of the month, and the amount made as the debit, with the sales, and inventory at the close of the month, as the credit, while the balance would be the actual profit or loss of the particular product. A report from the cost department would supply the inventory or amount on hand of each at cost prices, hence the actual record of everything sold is maintained. If ground wood and sulphite, or either of them, were also sold, these accounts would be shown in like manner. When this is done the cost records are very complete and valuable, and the management has a great advantage over competitors who are not so thoroughly informed as to their business.

## THE BOOKKEEPER'S MONTHLY REPORT:

It is of prime importance that the management should become acquainted with the facts and features of the business which the cost and accounting systems I have roughly outlined is capable of disclosing; many intelligent and capable bookkeepers lack the faculty of compiling clear and comprehensive reports of the monthly and yearly operations and transactions of a business. Too many produce a mass of detail that requires much hard labor to prepare, and when it is completed it gives very little real information and is rarely ever looked at—only one or two salient features are scanned and the rest simply "goes by the board." This is useless expenditure of energy.

I present herewith the outline of a form which can be printed and will "tell the story" in a brief and concise manner, capable of elaboration to any desired extent of detail by means of supporting data prepared as "exhibits." The exhibits I have designated are the combination of the four cost reports before

mentioned (which any fair bookkeeper can correctly figure, and the figuration must be correct or the statement will not be in equilibrium) and a statistical statement having columns for the name of each grade of paper and other products sold, quantities, sales price, gross sales, deductions, net sales, cost of sales and manufacturing profit and loss. If the auxiliary records before alluded to are kept, there should also be columns for sales and administrative expense and other revenues and expenses, and the net profit, which makes a perfect report.

In addition this exhibit may have additional columns for any further statistical records desired to show ton records in addition to cwt. records, *i.e.*, sales tons, cost per ton, selling price per ton, profit per ton, also to show time records, etc., but the form given will be sufficient for supporting the items designated on Form 6 as "Exhibit A." Thus the Income and Profit and Loss section of the statement shows at a glance just what has occurred during the month, how it affects the record for the year and how this latter compares with the last year's record. This latter feature will, of course, require the operation of the system for one year before it can be available. The Balance Sheet or statement of the firm's present standing compared also with the figures of the year before, is also as brief as possible, and as in the case above, affords a study of the operations in materials and supplies (which is a replica of the ledger account for same) and the combined cost reports as explained. These latter should be made on printed forms especially designated for the purpose, so as to show the current month and year to date in separate sections. The net profit shown in the Income and Profit and Loss Statement must, of course, correspond with the same item in the balance sheet and both are supported by "Exhibit A."

It has required a vast amount of research, analysis and study to devise this system of cost accounting designed to fit any wrapping-paper mill, and founded upon the correct principles of cost accounting as it applies to the industry. You will scarcely realize the magnitude of the job I undertook and have worked out, I trust to your entire satisfaction. I could not confine myself to any one mill, but have had to carry in mind, as it were, a composite of all the mills I was privileged to review and of the many points I had to learn by inquiries. I desire to thank the many of your members who have, by letter and word of mouth, given me the aid and support without which it would not have been possible to complete the work.

If there is information on any points that I have not covered sufficiently clearly, or upon which your members would like to make further inquiry, I will be pleased to answer any such communications direct.

I should like very much to devise and install a few systems for some of your members, which would, of course, have to be established upon the principles I have recommended, because in my opinion they are the only true principles, for then I could demonstrate clearly the many benefits and advantages a *real* cost system would afford, and how by its aid the cost of production can be substantially *reduced and kept down*. The cost system I have described can be operated *very economically* and it will pay for its installation and maintenance cost in a comparatively short time.

In addition to the cost records, valuable records calculated to promote efficiency can be maintained and I dare say there is scarcely a paper mill in existence that cannot be improved, generally to a remarkable extent.

Also, if the principles of this system are adopted by your Association, a specially designed form can be printed and furnished to each firm member upon which they would render their monthly reports to you. These reports then

would be of great value, because all costs would have been figured upon a uniform basis—which is an ABSOLUTE REQUISITE before you can hope to accomplish the results you have anticipated of correcting the many evils in the selling department of the industry.

Respectfully submitted,  
 CHAS. H. CASE,  
 Certified Public Accountant.

### RELATIVE TO FORMS

These forms are designed simply to illustrate the *principles* involved and are in no way complete.

Form 1 should be prepared with great care, and columns arranged for all items which may be desired to be shown. For instance, it may be desirable to have four sections instead of three given, viz.: Stock Ordered, Debits, Credits and Balance. In the first section would be entered all purchase orders: Date, Purchase Order Number, Quantity, Time of Delivery and Quotations. This form would then show not only if stock were low, but if the Purchase Department had become aware of the fact and had provided for replenishment. As each item ordered was received it could be checked off in a small column provided for the purpose so that all unchecked items would indicate outstanding orders.

The other forms could be printed in any manner desired, giving in separate sections the stock used and total, the conversion and total, and the fixed charges and manufacturing total, using the nomenclature in use at the present time.

## FORM 1

### PERPETUAL INVENTORY RECORD

Maximum.....

Minimum.....

ARTICLE

SIZE

Location.....

Date	Received from or Used for	Pcs.	Quan.	Rate	Value Recd.	Value Used	Quan.	Value on Hand



**FORM 4**

MONTH OF ..... 19...

**COST SHEET**

**MACHINE NUMBER**

**HOURS OF OPERATION**

Production

Items	Quan.	Amount	Total Cost	Kind	Hrs.	Quan.	Cost	Posted Amount
Material								
Hemlock Sulphite..								
Spruce Sulphite....								
Ground Wood								
Spruce .....								
Broke .....								
Size.....								
Alum.....								
Colors .....								
Direct Labor								
Beater Room.....								
Machine Room....								
Finishing Room...								
Expenses								
Indirect Labor....								
Power, Light, Heat (supply items)								
Repair Items								
General and Over- head Items								
Total Cost Gross..								
Less Broke Pro- duced.....								
<b>TOTAL COST NET..</b>								

**FORM 5**

**COST ACCOUNT CARD (OR SHEET)**

Maximum.....

Article  
or  
Grade

Size  
or  
Weight

Minimum.....

Location.....

Date	Recd. From or Used For	Quan.	Cost per Cwt.	Ma- terial	Labor	Ex- pense	Total Cost	Quan.	Value on Hand

**FORM 6**

**MONTHLY STATEMENT**

Month of ..... 19..

**INCOME AND PROFIT AND LOSS ACCOUNTS**

	Current Month	Year to Date	Preceding Year
Sales (Exhibit A) .....			
Less all Deductions (Dr.) .....			
Net Sales (Dr.) .....			
Less Cost of Sales (Dr.) .....			
Gross Profit (Dr.) .....			
Less Administrative and Selling Expenses..			
Commissions .....			
Advertising .....			
Salaries .....			
All Other Accounts .....			
Total A. & S. Expenses .....			
Misc. Income .....			
Less Any Other Expenses .....			
Net Profit (or Loss) (Exhibit A) .....			

**BALANCE SHEET**

	Year to Date	Preceding Year
<b>Assets (Current)</b> .....		
Cash .....		
Notes Receivable .....		
Accounts Receivable .....		
Materials and Supplies (Exhibit B) .....		
Ground Wood                   "    C .....		
Sulphite                       "    D .....		
Paper                           "    E .....		
Real Estate and Buildings .....		
Machinery and Equipment .....		
Any Other Accounts .....		
<b>TOTAL ASSETS</b> .....		
<b>Liabilities:</b>		
Notes Payable .....		
Accounts Payable .....		
Other Liability Accounts .....		
<b>TOTAL LIABILITIES</b> .....		
Balance—Assets in Excess of Liabilities .....		
 <b>Capital Account</b>		
Capital Stock .....		
Bonds .....		
Mortgages Payable .....		
Surplus Account Bal. ....		
Profit (or Loss) This Month .....		
Balance (as above) .....		

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