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# ACCOUNTS

## THEIR CONSTRUCTION AND INTERPRETATION

FOR  
BUSINESS MEN AND  
STUDENTS OF AFFAIRS

BY

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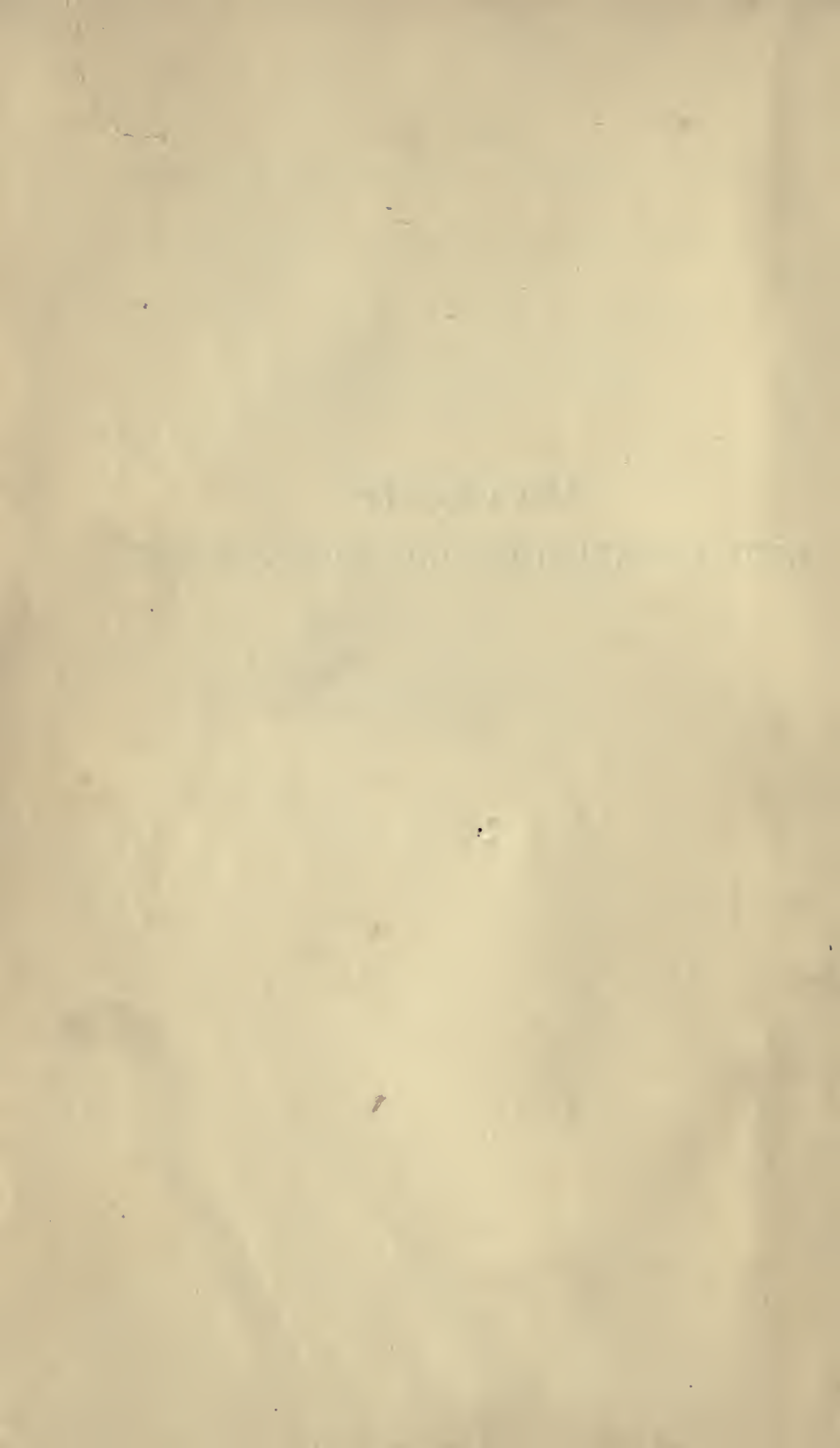
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# ACCOUNTS

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### CHAPTER ONE

#### INTRODUCTION

It is common to read in a report concerning the failure or suspension of a business house or corporation that not until experts have been at work upon the books for several days or weeks can any one learn the exact state of assets, liabilities, or loss. The frequency with which this statement is made naturally suggests a causal connection between accounting and success. The connection suggested will be found on examination to be existent in a large proportion of the cases of business failure.

The average business man does not know what things cost him. The head of the manufacturing department of one of the large consolidations, commonly called "trusts," recently remarked that before consolidation he used to wonder how some of his competitors could afford to take contracts at their own bids. After the consolidation he discovered that these competitors never knew even approximately the cost of manufacturing their goods and often took contracts at an inevitable loss — which simply happened to be made good by large profits on other contracts. This is typical for much of our American business, but good accounting can forestall many of the elements of bad luck and show just where lies the good. In view of the remarkable success of American trade in spite of much bad accounting, — or, rather, in spite of no accounting at all in thousands of establishments, — one is forced to anticipate phenomenal success when good accounting shall become general.

Perhaps no field in connection with business activity in America has advanced so little in the last twenty-five years as accounting. The changes in the economics of industry have been marvelous:

theoretical science has been applied practically, social forces have been utilized, and the spirit of organization has taken hold of every element to bring out its maximum utility. Yet until a few years ago accounting had remained well-nigh stationary. Not many years ago, most businesses were conducted on a small scale. In both manufacturing and commerce, certain direct costs were involved in raw material and stock, in rent, service, insurance, interest, and risk; and the return or income was equally simple in the form of payment for goods sold. Few business houses attempted more than one line of activity: they bought a few raw materials, which they converted by comparatively few processes into staple lines of goods, or they bought finished goods, which they distributed by comparatively simple methods. For this sort of thing simple devices for subtracting cost from return, in order to show profit, were sufficient. With the growth of industry, involving competition so keen that profit must be figured with extreme closeness, and with the advance of organization, such that one house manufactures not only its principal product, and its numerous by-products, but perhaps hundreds of inferior products as supplies for its own consumption, the old methods of accounting have been found utterly inadequate. The greater the variety of work attempted, the more easily does any leakage or waste pass unnoticed, and yet the more does it hamper in competition. In the old days, when each firm bought its supplies and added but one step to the manufacturing or distributing process, — with a considerable margin of profit, — a slight leakage was not of serious import: it affected the profits of one firm, but it did not affect the next firm concerned in the general process.

This may be well illustrated, perhaps, by the time-table of a through railroad train, running over several lines. The schedule is arranged to allow leeway of several minutes at each junction point. Such a train may lose time on every section of road except the last, and yet arrive at its destination on time. The loss on each section simply reduces the wait at the next junction point. Yet a train booked to make absolutely close time for its full run can lose no time at any point without some failure at its destination. Business used to be conducted on the fashion of the leeway time-table. The margin or leeway was the profit of the middleman — which might be increased or reduced without affecting the next producer. Modern

business is conducted practically on a close schedule — especially when all the branches of an industry are conducted under one control. Nowadays, in large industries the cost of a finished product in one department is *ipso facto* the cost of raw material in the next. No leeway is allowed. Any leakage suffered at any point is concentrated in a magnified loss at the end.

When business was simple, but few alternatives in methods were possible; but now that the complications are great, the possible alternatives of process and of organization are many. How can one learn the comparative economy of two processes or of two systems of organization except by very elaborate and detailed records of results? And the greater the number of alternatives, the more detailed must be the records.

It is the merest commonplace to say that, if a business house is conducting four lines of operation of which one causes loss while the others are profitable, the manager would be foolish not to drop the bad one and push the most profitable of the three. Yet how shall he know whether any fails or any is more profitable than the others? Surely not by simply finding his total profit or loss for the year. It is quite as important for future guidance to know the comparative profitableness of various enterprises as it is to know their combined earnings or cost.

An illustration of comparatively simple industry is mining. In one day the expenditures at a mine may include the following: wages for digging and raising ore, for loading and transporting ore, for cutting a new gallery, for sinking a new shaft, for pumping water, for repairing a hoisting engine; payment for a new boiler for increased power; taxes upon mineral land bought but not yet worked. How are these expenditures related to profits, and how shall we determine profits for the day? A part of the expenditure — digging, raising, loading, and transporting ore — was direct cost of producing that day's ore, and, being entirely exhausted once for all, must be paid for ultimately from the value of the ore to-day extracted. The cost of cutting a new gallery has not entered into the cost of to-day's ore, but may enter into the cost of getting next month's ore, and next year's ore; and yet back in the past the cost of cutting some gallery which was worked to-day was a part of the cost of to-day's ore. Do the two costs correspond? If not, how far do they fail to correspond?

The cost of sinking a shaft to-day may contribute to next year's ore, and that of ten years hence, or even that which the grandchildren of the present owner may mine. How far is it cost to-day, or how far is it a fair measure of the cost of to-day's ore? The cost of pumping out water after a freshet is, in a sense, no part of the direct cost of any ore, but is a direct loss. It may be due to defective engineering when the mine was opened. How shall we treat it in relation to to-day's profit? The repairs on the hoisting engine are not related directly to to-day's ore, but belong to the past. Taxes on land not yet used may have no relation even to the early future. How shall we treat them?

Innumerable questions of this sort must be answered before profits for any year can be determined. This, moreover, is but a part of the problem of successful accounting. Total profit is not enough to know. No one would wish to work twenty galleries if nineteen would be more profitable. How shall one know whether each of the twenty galleries is profitable? Finally, there are many possible alternatives of method. What ore is better thrown away than worked? Is it cheaper to sell ore than to smelt it? Is it cheaper to transport it to a distance than to smelt it at the mine? Nothing but careful accounting can furnish bases for answering such questions.

It is easy to sneer at statistics as too dry, both in the making and in the reading, to interest the man of active temperament; but every business man of wide experience knows that often, in the choice of a basis for business operations, the difference between statistics and guesswork is the difference between success and failure. It is true that the accountant is merely the historian of business; and as the historian of deeds is less important than the doer, so the rank of the accountant in business is comparatively low. Yet often, as the historian sees more deeply into politics than the busy politician or statesman, so the accountant sees more deeply into business transactions than the manager himself. A statesman who disregards history makes himself ridiculous; a business man who cares nothing for accounts often makes himself not only ridiculous but a pauper.

The processes of record bookkeeping are almost as simple as primary arithmetic; but what in this book we shall call accounting comprehends far other elements. Accounting, in the sense in which it is used here, is scientific analysis and record of business transactions.

It attempts to tell about every transaction everything that can be of service when known. It attempts to show the result of every effort, the cost of every return. Only by its aid can satisfactory comparison be made of different enterprises and different methods. This book is an attempt to set forth in simple form the main principles which must govern any attempt at accounting. Since scientific analysis of business transactions is hardly serviceable until recorded in intelligible form, the fundamental principles of record bookkeeping will also be briefly stated and illustrated. No attempt will be made to discuss or illustrate all even of the common forms of bookkeeping, nor will the shortest forms be necessarily chosen, or even mentioned; indeed, for the purposes of this book, the longer and more old-fashioned forms will often prove more serviceable. The aim here is not to show short-cuts and bookkeeping-made-easy, but thorough discussion of principles, so that the student of the book shall be master of something better than rules of thumb, and shall be able to judge for himself what short-cuts will serve his purpose. The book is intended to be comprehensive for principles, but is not meant for an encyclopædia of bookkeeping forms and practice. Many excellent manuals of such sort are on the market. For the convenience of those who are already familiar not only with bookkeeping practice but also with the philosophical basis upon which it rests, these matters are discussed by themselves in Part I. Part II is devoted entirely to the analytical side of accounting. The later chapters of Part II attempt to make general principles more concrete by applying them to the problems of different lines of business in which they may be best illustrated — without, however, entering into technical details of any business.





PART ONE

THE PRINCIPLES OF BOOKKEEPING



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responsibility } some thing?

## CHAPTER TWO

### DEBIT AND CREDIT

At the basis of all accounting is the distinction between debit and credit. In simple transactions of sale and payment, few persons find difficulty in deciding which is which; but in many complicated transactions, involving rights and claims, confusion easily arises.

Debit (from the Latin *debet*, he owes) means, in accounting, not merely that something is owed, but that a definite person (or personified property or force) is responsible for some value. All three elements of this meaning are important: first, the responsibility attaches to a definite person or thing named; second, the responsibility is not necessarily a debt, but often may be acquitted in some way other than by payment; third, the responsibility has its origin in a definite consideration of value. The importance of these three elements will appear later.

Credit (from the Latin *credit*, he intrusts) means the converse of debit, *i. e.*, a definite person (or personified property or force) has granted some definite value. This again involves the same three elements: the grant was made by a definite person or thing named; it may be in an intangible form, — in a claim, in the surrender of a right, or in the discharge of a responsibility; it must be susceptible of statement in dollars and cents. That credits do not always represent debts is shown by the fact that capital stock commonly appears on the credit side of corporation reports. The corporation is accountable for the capital stock, but it does not, in the ordinary sense of the word, owe anything upon it.

A few illustrations will be necessary to make clear just when an account should be debited and when credited. The record "J. Jones, Dr., \$1000," means that by the business house upon whose books it occurs J. Jones is held responsible for a thousand dollars; but without further explanation we cannot tell whether Jones owes a thousand dollars or is merely to account for his use of a thousand dollars which has been intrusted to him. So far as mere debit and credit are concerned, the two types of responsibility are identical; and hence

some detailed record of the transaction other than debit and credit is required. It is to be noted, however, that each entry may be independent of every other. When Jones discharges his responsibility, either by paying the debt or by performing the service, he must be credited, for in either case he will have intrusted or granted value to the firm with which the transaction occurs. Yet the bookkeeper does not need to know, before making the entry, whether Jones had been previously debited for his responsibility. The credit to Jones is made at the time that the grant of value is made by him, whether he has been previously paid or not; and the debit to him is made at the time that he is paid, whether he has previously granted the value in return or not. If entries are accurately made when the transactions occur, each may be absolutely independent of every other, and the whole truth may be learned at any time by taking them in combination. The whole matter may be briefly summarized in this form: when an account takes a responsibility (that is, becomes accountable for something), debit it; and when an account puts a responsibility somewhere else (which is sometimes getting rid of accountability previously taken), credit it.

This emphasis upon responsibility may seem for the moment somewhat unnecessary, but in some cases only by reference to responsibility can we determine whether an account should be debited or credited. For example, a common means of acquitting responsibility is drafts. The bookkeeping entries made in connection with a draft well illustrate the philosophy of debit and credit. We will assume that Jones is responsible to you, the reader, for \$1000. We will assume, too, that you owe your broker \$1000. It may happen that the broker owes Jones. In that case, these various responsibilities will show on the various books as follows:—

<i>Reader's books :</i>	<i>Jones's books :</i>	<i>Broker's books :</i>
J. Jones, Dr. \$1000	Broker, Dr. \$1000	Reader, Dr. \$1000
Broker, Cr. \$1000	Reader, Cr. \$1000	Jones, Cr. \$1000

Now Jones draws a draft on the broker ordering him to pay you \$1000, and the broker, by agreement with you, pays that draft by canceling your debt to him. In such a case, you have received nothing and have paid nothing. Upon your books you debit the broker and credit Jones, — on the ground that the broker is responsible for keeping the money that he was ordered to pay you, and that Jones

has got rid of his responsibility to pay you. If the broker were not already credited with what you owed him, his responsibility would now show as requiring to be acquitted in the future; but as such credit already appears on your books, the two entries read in combination show that the responsibility just now taken was discharged before it was taken, and that you are square with the broker. If Jones were not already debited on your books, he would now appear to be your creditor for \$1000; but the two entries read in combination now show that you are square with Jones.

No other rule but that of responsibility is sure to serve the inexperienced in determining whether to debit or to credit an account. Sometimes a rule is given as follows: "Debit destination and credit source." This rule serves in simple transactions, but sometimes two evidences of value—or none at all—are involved, and the source of one is the destination of the other; so that for the inexperienced the rule either gives confusion or recommends two entries which would counteract each other.

In every case a responsibility can be traced. Sometimes, however, the responsibility is such as often we have in mind when we use an expression like "The weather is responsible for the delay." It is customary in business to debit losses or expenses to particular accounts which represent not persons or other tangible things, but, rather, mere forces; for it is not enough to know debts and property, — we wish to know the sources or causes of gain or loss. When we pay interest, therefore, we should debit Interest Account — the debit standing for loss or expense; for interest is responsible for the loss, — just as bad weather may be responsible for delay. If it were not for that force in business which we call interest, the loss would not have been suffered: hence Interest Account is responsible. Interest Account is credited when interest is earned. The use here of a credit, too, is consistent with our general principle: we debit for a responsibility taken by an account, and we credit for a responsibility conferred by an account; and here that force which we call interest has earned for the business, has granted to the business, a profit which the firm is now accountable for.

We have already noted two kinds of accounts, — with persons and with forces. A third kind, with property, shows the same relations with debit and credit. In all careful accounting, record is kept of—

cash on hand, notes, merchandise, real estate, and other similar tangible property. At first thought, the application of debit and credit to these seems arbitrary, for responsibility seems hardly to attach to such accounts. A reminder of what these accounts stand for, however, shows the philosophical basis of their treatment. Every one knows that the purpose of a cash account is to show what cash ought to be on hand. The cash balance on the books, then, is a liability of the cashier, or cash-drawer, or bank, or what not. No respectable bookkeeper makes up his cash account from his cash-drawer: on the contrary, he fixes the responsibility of the cash-drawer by the cash account. Thus the cash account represents quite as truly a responsibility as does an account with an outside firm; only, in this case, the responsibility attaches not to an outsider but to a department or agent of the business itself. The same thing is true of a note account, a merchandise account, a real-estate account, and the like. In the case of real estate, for example, an account entitled "Store, No. 6000 Six Hundredth Street," would represent the property as a depositary of so much value. When the store was bought, the account should have been debited — as responsible for the value, a sort of depositary. If, now, half of the store be sold, the account should be credited with the value of that half, the account being acquitted of so much of its responsibility as a depositary.

We have, then, three kinds of accounts, — those representing persons, those representing forces, and those representing property. Now, an interesting relation exists between the last two classes. An account representing a force is debited when responsible for a loss; an account representing property is debited for property received. Property received and loss suffered, therefore, are treated as if exactly alike, although in reality two things could hardly be more unlike. This shows the absolute necessity of knowing just what each account represents. For example, let us suppose that we buy ten thousand tons of ice, and enter it to the debit of a property account called "Silver Pond Ice." Perhaps tramps set fire to the ice-house, and the ice, which is uninsured, is melted by the fire and by the subsequent exposure. Must we necessarily make any entry upon our books to show this loss? We might debit Loss and Gain Account as responsible, and credit "Silver Pond Ice" as acquitted of its responsibility; but this is hardly necessary. If we merely change the classification

of our Silver Pond Ice account, considering it now as an account representing a force — in this case loss by fire — rather than property, our books are still correct, and our principle of debit and credit has been satisfied. The difference is simply that at the close of the year, or quarter, or other period for determining assets or profits, we must take care that the Silver Pond Ice Account is included in the schedule of losses and not in that of property. If you send an errand boy with a hundred dollars, with fifty of which he is to buy merchandise and the other fifty of which he is to contribute for you to a relief fund for starving people in China, his responsibility is as fully discharged by the receipt for the relief fund as by the merchandise, though one from the business point of view may represent pure loss and the other represents property. Both expenditures of fifty dollars are debited — one perhaps to Charity Account, which satisfies accountability, and the other perhaps to Merchandise Account, which shows what you may hold your warehouse liable for. The purpose of debit and credit entries is solely to record responsibilities, and responsibilities may be discharged in so many ways that care must always be taken to distinguish between those that show liability and those that show merely accountability.

Out of the view of debit and credit as it has just been given has developed the double-entry system of bookkeeping. It is obvious that a business responsibility cannot spring from nothing. Everything must have a source or cause. If money, or any other valuable thing, has come to a business, it is obvious that but two explanations are possible: either some one has conferred something upon the firm (by the payment of debt, by loan, or by sale on trust), or else profit has been made. To debit the cash or other property account is not enough, then; for if one wishes one's books to show all that they can show, one must record the source of that value — either in a personal account or in an account representing an earning force, such as interest, rental, or what not. So, too, if property is sent away, some cause must be behind the outgo, — a loan, a payment for debt, a purchase of other property, or a loss on account of some force. In that case some property account must be credited, as always happens when a property account has given up a part of the value for which it has been held responsible, and some other account must be debited to show what has taken the responsibility. It is

inconceivable in strict business that property should be either received or sent away, or that profit or loss should be made, without an assignable responsibility conferred on one hand and taken on the other, and all good bookkeeping shows both sides of each transaction. This is all that is meant by double entry. A debit or a credit can be but half of any transaction; for whether it records responsibility for property, claim, profit, or loss, it involves an explanation, and that explanation must show where that responsibility came from. Perhaps only an illustration can embody the whole principle. It seems correct and sufficient to debit cash for the finding of an unclaimed and unexplained hundred-dollar bill on the office floor. Nothing seems to be involved. There is no assignable source for the profit. Yet that very fact is what the books should show. An account must be opened for that sort of thing — perhaps called “Chance,” or “Luck,” or “Cash Variations.” Ordinarily such things would be carried to the so-called “profit and loss” or the “loss and gain” account, where, at the end of the year, they are lumped with other gains or losses. Here, when property account, Cash, is debited, an account representing a force, as Loss and Gain, should be credited, to explain the property change — on the principle that no change could have taken place in the property account without adequate cause. The entry would be, then, “Cash, Dr., to Loss and Gain, Cr.” So, too, when a loss is suffered, a cause is bound to exist, and that cause should be recorded. If a note is discounted, the discount is taken from the face of the note and the effect of the force that produces it is registered as a debit to Interest (or Discount). Cash is here credited, of course; for as cash has been properly lost, the cashier, or cash-drawer, is by so much acquitted of responsibility. The entry is: “Interest, Dr., to Cash, Cr.”

Double entry, then, means not that each transaction is entered twice, but only that each transaction is entered from a double point of view — cause and effect, or source and destination. As will be shown later, this does not involve double labor on the part of the bookkeeper, for by certain devices, special columns and special pages and special books, extra work in recording by double entry is almost wholly avoided.



## CHAPTER THREE

### THE FUNDAMENTAL BOOKS

SCIENTIFIC bookkeeping is possible even with very few books. The use of great numbers of books in large counting-houses has its origin not so much in the method of bookkeeping as in the magnitude of the business recorded. To be sure, the books in such a counting-house are of many sorts and are complicated in form, but the variations from simple types have arisen hardly at all from a desire for better accounting, but chiefly from a desire to make accounting more economical. Probably no accounting is conducted anywhere that could not be conducted with equal correctness by means of the old-fashioned set of three simple books — day-book, journal, and ledger. In many cases, however, such accounting would require by old methods one hundred bookkeepers where now ten suffice. No attempt will be made in this book to do more in the matter of mere record bookkeeping than to show the principles of simple books and to explain a few of the most common types or systems of abbreviation.

☛ The most obvious duty of a bookkeeper is to record each transaction in such detail that at any time in the future its history can be determined without shadow of doubt.

The simplest type of business record-book is the old-fashioned day-book — practically a diary — which has now been supplanted. Its principle, however, is enduring, and must be understood. In it each transaction is given a paragraph, which tells all detail that can possibly be of use for future reference. For example, when goods are shipped, not only the amount, quality, and price should be given, but, where possible, case-number, or car-number, or other means of identification. When payment is made by a note, the record should show for future reference a number of details sufficient to identify that note, such as its date, time to run, payee, amount, and the like.

This does not mean, however, that duplication of record is desirable. When all notes are recorded in a separate register, as in most counting-rooms nowadays, the day-book entry needs to record

for identification only the number of the note, leaving the other book to furnish the details. So, too, when, as in most manufacturing concerns to-day, an order-book is kept, details of shipments may be left to that book, the day-book presenting for identification only the number of the order.

An old-fashioned day-book entry looks like this:

	August 10						
Sold James Madison, on 30 days' time							
8 M. ft. spruce lumber	@ 15	\$120	00				
3 M. clear cedar shingles	4	12	00			132	00
B. & M. R. R. #26,341							

or this:

	August 12						
Received of James Madison his note, dated 8/10, on							
30 ds., in payment of his invoice of 8/10						132	00

This day-book is of great value as legal evidence, for it is an original document. It is supposed to be a faithful record, written at the time of the transaction. Nothing but receipts or other signed vouchers can be better evidence, and it is for this reason that the day-book is of utmost importance. Such a book should be absolutely free from erasures in any vital figure, for each erasure testifies to the deficiency of the book as an original document. Errors will creep in, of course, but they should be corrected by counter-entries. For example, an error in price may be counterbalanced by another entry charging or crediting the difference and indicating distinctly which entry it is designed to correct. The original entry should be marked "Erroneous," with an indication where the correction is to be found; for otherwise it fails to tell the truth. If the error has been made by debiting the wrong man, correction may be made by crediting him and debiting the right man. (Bookkeeping never works by subtraction: it produces the desired result by adding to the contrary side.) Since all other books contain theoretically mere transfers from the day-book, they are of comparatively little importance as evidence. It is only in so far as it can be shown that the other books are correct transcripts of the day-book, or are themselves original documents, that they are valuable in court.

In actual practice, one common kind of transaction practically never goes upon the day-book. As it is convenient to keep cash items

by themselves, so that the record of cash may be compared with the actual cash on hand, cash is usually entered in a special cash-book only. This in its simplest form is nothing but a part of the day-book containing items specially selected for a particular purpose. It will be described in another chapter.

It is obvious that for a business man to run over innumerable pages of his day-book, and pick out an item here and an item there, in order to determine (for example) how much interest he has paid in the last few months, would be not only a tedious task, but also one which by a slight oversight might utterly fail of its purpose. It is very easy, when running the eye over many pages, to miss an item which is for most purposes unimportant but may be extremely important for the matter in hand. For purposes of convenience, in order to classify all items so that each shall appear where it can easily be found, all business houses keep what is called a ledger. This ledger is really a sort of combination of index and figurative set of pigeon-holes. It classifies and pigeon-holes much desirable information, and what it does not fully pigeon-hole it indexes. In a ledger, definite space (a page, or more, or less) is assigned to each person, or force, or kind of property, with which it is worth while to keep an account, and in that space, in parallel columns, are written, without detail but with index references, all debits or credits relating to that account. Simple addition shows the total debit or credit for each account at any time. The purpose of the ledger is simply to rearrange the items of the day-book so that, whereas they stand in the original book arranged by transactions, they stand in the ledger classified according to the persons, forces, or property concerned. The ledger, being a mere rearrangement of day-book items, has no standing in law, except as it is recognized as a faithful transcript of the original document. It is not a *record*, but a *summary*, for the convenience of the *business itself*.

A ledger page looks somewhat as follows:

JAMES MADISON

Aug. 10 | Mdse. | 92 || 132|00 || Aug. 12 | Bills Rec. | 94 || 132|00

The column beyond the date column on each side is intended to show what other account was credited or debited when this account was debited or credited, and the next column in each case gives the page

number of the original entries, so that details may be easily found. Thus the ledger serves as a complete index for the day-book. Debit items are always placed in the left column, and credits in the right. Always, it is to be remembered, debit means that the person whose name appears at the head of the space is the person responsible, and not that the firm on whose books the name occurs is responsible to him. Debit means "He is responsible." All items occurring under any one name in a ledger are technically known as "an account," and the word "account" will hereafter be used in that sense. To open an account is to introduce a new name into the ledger, with items attached to it. If, for instance, a firm has been keeping an account called "Expense," and has been carrying to it all items such as stationery, lights, fuel, and the like, and now it decides to keep fuel by itself, it would open an account called "Fuel" in the ledger, and would carry to it all items considered to pertain to fuel.

Transferring accounts from scattered positions in the day-book to classified positions in the ledger is called "posting." Our common slang expression, "He is well posted," is taken from bookkeeping parlance. We usually mean by it that the latest facts are classified in the man's mind under their appropriate heads, so that he is in a position to summarize the situation. So, in bookkeeping, posting is breaking up day-book entries, so to speak, and distributing the parts among the accounts concerned, so that the condition of any account may easily be summarized.

This process of posting is easy when the transaction is simple; but, when many details are involved, much care is necessary to provide against error. When the posting is done, moreover, one who is to see what disposition of the matter was finally made must refer to each ledger page to which postings were carried. Some transactions are so complicated that a memorandum of the intended disposition of the various elements is a practical necessity for posting, and the preservation of such a memorandum is likely to be a convenience. From this necessity and this convenience sprang up the old-fashioned journal, which is simply a book in which is recorded in one place the intended disposition, for posting, of the elements of all transactions. A simple journal entry, therefore, would look like this, using for illustration the transactions already given for the day-book and the ledger :

Aug. 10	James Madison To Mdse.	132 <sup>00</sup>	132 <sup>00</sup>
Aug. 12	Bills Receivable To James Madison	132 <sup>00</sup>	132 <sup>00</sup>

If, however, the transaction involved many details, the entry would be more complicated. Let us suppose, for illustration, that freight is to be prepaid on the merchandise sent to James Madison, that the amount of the freight is to be added to his bill, and that he is to pay extra for carting. In that case the day-book entry would have included these details, and then the journal entry would be as follows:

	James Madison To Sundries Mdse. Freight Carting	149 <sup>00</sup>	132 <sup>00</sup> 16 <sup>00</sup> 1 <sup>00</sup>
--	---	-------------------	--

The word "sundries" as used here is simply to show that the equilibrium of debit and credit, which must always be preserved, is between one account on one hand and a group of accounts on the other. Many bookkeepers do not use it.

If the shipment were made to two men, not in partnership, but each held responsible for one half the charge, the entry might read

	Sundries To Sundries James Madison James Monroe Mdse. Freight Carting	74 <sup>50</sup> 74 <sup>50</sup>	132 <sup>00</sup> 16 <sup>00</sup> 1 <sup>00</sup>
--	---	--------------------------------------	--

In making journal entries bookkeepers put debit items in left-hand columns and credit items in right-hand columns, and thus posting may be done rapidly.

It is obvious that such journal entries may serve not only as convenient memoranda of what debits and what credits were made for each transaction, but also as convenient indexes for day-book entries. It is much easier to find an entry when it is given in this abbreviated form than to find it in the diary form of the day-book. This record, moreover, is made still more complete as an index by

means of the narrow column just before the names. This is used as a check column, to show when the posting has been made, and the check mark used is commonly the number of the ledger page to which the item has been posted. It is important to note that such check mark should never be written until the posting has been actually made, and then should be made immediately; for so many interruptions occur in every one's work that to check a posting before it is made — even when the ledger page is open before one — is to run the risk of a loss of the amount in question or of need for a long search for error.

With the exception of red-ink memoranda, to be described in another chapter, nothing should ever be entered in the ledger except as posted from the journal or some special book containing the essential features of the journal.

The three books that have been described are at the basis of all the books now in use: others are mere modifications of these, and an understanding of these is essential for an understanding of the others.

## CHAPTER FOUR

### THE SIGNIFICANCE OF PARTICULAR ACCOUNTS

It is desirable, before discussing further the form of books, to understand the significance of the most important and most common accounts, for the modifications made in the simpler books have been made with regard chiefly to the functions of these particular accounts.

An account has already been defined as all the items standing to the debit and the credit of one name in the ledger. Accounts are of two sorts — internal and external. External accounts are those kept with persons, partnerships, associations, corporations, and the like; they show the responsibilities of the business toward such persons or organizations, and the responsibilities of such persons or organizations toward the business. Even the account of a sole proprietor is an external account, for every business is in good accounting considered as a real thing, as an entity apart from its proprietor. The business has relations with its proprietors, of course; but those proprietors are not the business, and for the purposes of accounting they are treated just as any outsider is treated — debited for property taken from the business, and credited for property granted to it.

Internal accounts, on the other hand, have no direct relation with any one outside the business, or even with the proprietors, but merely represent the different pieces of property and different forces at work within the business itself. No account is ever kept, within a business, to represent the business itself as a whole, but many accounts are kept, or should be kept, to represent the different parts or phases of that business. Examples of such accounts are Merchandise Account, Cash Account, Interest Account, Wages Account.

It is to be noted that no account should be opened to represent anything which from the nature of the case is incapable of having both debit and credit relations. A mere list can never be an account. For instance, an account should not be called John Jones's Debts;

for the title itself signifies a debit relation and no other. How could a payment be recorded? Certainly not among the debts. If not, how could the payment of debt be shown on this account? The title of the account should be simply "John Jones." Then both debits and credits may be entered, and the balance, if any, will show his exact relation to the business. If for any reason this account ought to be distinguished from some other account with John Jones, it might be called "John Jones Trading Account," or "John Jones Loan Account," or be given some other distinguishing title.

What are here called external and internal accounts are often called personal and impersonal accounts; but the former designation is more logical, for only by chance is it true that external accounts always represent persons, and internal accounts always represent impersonal things. The fundamental distinction is between accounts which represent the responsibilities of the business in relation with the outside world and those which represent the responsibilities of the various elements of the business in relation with one another.

It would be theoretically possible to keep records of business without one internal account; but such records would fail to show sources of profit or causes of loss, and at best would show gross amount of profit or of loss only by means of comparison of property with liability,—and that is no accounting at all.

The most nearly universal internal account is Cash Account, or Cash. (The use of the word "account" in ledger titles is usually unnecessary, and henceforth when a common noun is found spelled with a capital letter the reader will understand that the word is used as the title of a ledger account.) To Cash go all items of money, checks, and money orders, but not usually time drafts or negotiable notes. The distinction between checks and money orders, on the one side, and notes and drafts, on the other, is of some importance. Cash ~~Account~~ is supposed to represent funds available without bargain or delay. The law has protected checks so much that except in cases of fraud they are as good as money; for to issue a fraudulent check and get money for it is to be guilty of obtaining money under false pretenses; but no such protection is attached to a note or a draft. A note is a mere promise; and a



draft, until accepted, is not even that. Hence a check is cash, and a note or a draft is otherwise classified. When cash comes into the business, from whatsoever source, the cash account is of course debited, or charged; for the cash-drawer is now responsible. Conversely, when cash is paid, the cash account is credited; for the cash-drawer has now granted something for the needs of the business, — *i. e.*, has given up that for which it was responsible. Under proper conditions, therefore, Cash can never show a balance on the credit side, for not more cash can have been paid than has been received. Usually a business house does not keep on its books an account with its bank, but treats cash on deposit as if in its cash-drawer: hence if its bank account has been overdrawn, cash may show an excess credit, but properly each overdraft should be entered as a cash receipt — for if honored it is a cash loan. The debit balance of Cash, of course, shows the amount of cash that should be on hand; for if all receipts are debited and all payments are credited, the difference must represent money received and not yet paid out.

The account in which negotiable notes are recorded is called Bills Receivable. Drafts which have been accepted by those upon whom they are drawn are also recorded in Bills Receivable; but drafts which have not been accepted are not recorded at all on the principal books, for until accepted they have no value other than that of any written request. It should be noted that Bills Receivable has a restricted significance, and does not at all include ordinary so-called “open accounts,” or “book accounts,” *i. e.*, sums owed to a business by customers to whom it has sold goods on trust. The term “Bills Receivable” is used only of promises to pay written in the form of promissory notes or of accepted drafts. It is to be noted, too, that, when a purchaser gives a note for goods bought, the charge for the goods must no longer stand against him on the books: he has paid for the goods by surrendering in exchange another form of property—a negotiable note,—and if he fails to pay the note suit is brought not for payment on the goods, but for payment on the note. Bills Receivable, therefore, has a definite technical significance. This account is debited, or charged, of course, when notes are received: that is, a note, being property, must be cared for and responsibility for it must be re-

corded; and that responsibility being taken by a file in the safe, the account which represents that file, Bills Receivable, is debited. The same thing may be put in another way. Originally the man who bought the goods was held responsible for payment, and he got rid of that particular responsibility by signing a note which served as a simpler form of claim upon him. As just noted, suit against him, if made at all, must now be made upon the note; and as the note has now become responsible for the ultimate payment on those goods, Bills Receivable should be debited. Conversely, when a note held by the business in its favor is paid, Bills Receivable is credited, for it has then brought money into the business, or, if you prefer to put it that way, has performed its responsibility. It is to be noted that Bills Receivable represents the *face value* of notes and not their cost or real value. It cannot, therefore, show a credit balance; for not more can have been credited on such notes than the face of the notes called for. If any excess has been collected, the excess was not on account of Bills Receivable but on account of interest, and Interest should be credited. The debit balance of Bills Receivable, of course, shows the face value of notes that should be on hand.

A similar account is Bills Payable. This represents not bills the business owes on "open account," but negotiable notes that it has signed, or drafts that it has accepted, promising to pay in the future. The treatment of Bills Payable is similar, though of course reversed, to that of Bills Receivable. When the business issues a note, either in payment for goods or to secure a loan, Bills Payable is credited; for Bills Payable has stepped in and conferred a benefit upon the business — has paid a bill for it or has borrowed money for it. Conversely, when a note issued by the business is paid by it, Bills Payable is debited; for Bills Payable is responsible for the outgo — as the weather is responsible for a delay. The Bills Payable balance must always be on the credit side, for not more notes can have been paid than ever were issued. If any excess has been paid, the excess was on account of interest and should be debited to Interest. The credit balance to Bills Payable, of course, shows the *face value* of notes outstanding against the business.<sup>1</sup>

<sup>1</sup> Inexperienced persons usually have more trouble deciding between debit and credit for entries to Bills Payable than to any other account. Usually, if Bills Payable

An account should always be kept with interest and discount. Interest is a sum paid by a borrower in addition to the principal sum which he in his note or other obligation has promised to pay; discount, on the other hand, is a sum taken out of the loan, in advance, by the lender, but not reducing the principal sum called for by the note at the maturity of the loan. If a man writes a note for a thousand dollars payable in a year with interest at six per cent., and can borrow a thousand dollars on it, he pays at the end of the year a thousand sixty dollars, of which sixty dollars is interest. If, on the other hand, he writes a similar note not bearing interest, he can borrow at a bank nine hundred forty dollars, and at the expiration of the year he must pay one thousand dollars. In this last case the sixty dollars taken out of the loan in advance is called discount, but though at a slightly higher rate than interest (sixty dollars for nine hundred forty, instead of sixty dollars for a thousand), it is of the same nature, and the two do not need to be distinguished in accounting. The account that represents them is usually called simply "Interest."<sup>1</sup> Interest is of course debited when interest is paid out, or discount lost, for then that force which in business we call interest is responsible for the loss; and, conversely, when interest is paid into the business, or discount is received, Interest is credited, for then the force which we call interest has conferred a benefit on the business. A debit balance of Interest

is considered as if it represented a person and then all entries are made on that assumption, the difficulties will be removed. If, when you wished to pay a bill and had not the money, a friend paid it for you, you would credit him; so, too, if a friend borrowed money for you and turned it over to you, you would credit him. Then when Bills Payable satisfies a creditor and enables you to postpone payment, or enables you to borrow money, credit Bills Payable. When you pay the friend, you debit him: so when you pay the note, debit Bills Payable.

<sup>1</sup> There is a theoretical true discount which is at no higher rate than interest, making the loan nine hundred forty-three dollars and thirty-nine cents, but it is practically always supplanted by bank discount, which includes profit for the bank not only on what it loans, but also on the discount taken out.

Still a third sort of discount is common, but this last sort is not usually included with interest. It consists of a reduction in price of goods when payment for them is made promptly, as when two per cent. is subtracted for immediate payment, as in some lines of business, or five per cent. for payment in thirty days, as in others. Such discounts are usually called merchandise discounts, and are kept distinct or included with merchandise; and we shall have occasion to discuss them later.

means that the interest paid on money borrowed amounts to more than the interest earned on money lent; and *vice versa*.

Another almost universal account is Expense. To this may be charged all expenditures incurred in conducting the business, such as for postage, stationery, telegrams, office-rent, clerk-hire, insurance. A debit to this account shows, of course, that the force in business which requires such expenditures is responsible for that outgo. Credit entries to Expense are rare, for only when an outgo of this sort, which was expected to be permanent, happens to be refunded can the account grant anything to the business. If you pay fifty dollars a year to a railroad for the maintenance of a private spur-track to your warehouse, and a neighbor who is allowed occasionally to use that track gives you in compensation ten dollars a year, that ten dollars should be credited to Expense. This expense account is perhaps the most elastic account in general bookkeeping. It may theoretically include so many things that in actual practice it is possible to find perhaps a hundred business houses no two of which put quite the same things into their expense accounts. A business house having many or heavy insurance charges is likely to wish to know just what it pays for insurance each year; and such a house will keep a separate account for insurance, omitting insurance from Expense. Similarly, special accounts may be kept with postage, stationery, telegrams, rent, and wages. Hence Expense may shrink to insignificance, or disappear entirely; but in such cases some other accounts are sure to perform its function, and these special accounts should be treated exactly as Expense itself would be treated.

In all mercantile houses, and in most manufacturing establishments, an account is kept for merchandise. Merchandise Account is debited when goods are bought, of course, for the account, representing the warehouse, is responsible for the care of the goods; and Merchandise is credited when goods are shipped, for then the warehouse has surrendered its responsibility. It is now to be noted that Merchandise is debited for goods at the buying price and is credited for them at the selling price, the difference indicating gross profit. Merchandise Account, then, does not, like Cash or Bills Receivable, represent property merely; nor does it, like Interest and Expense, represent a mere force: it is both a property account

and a force account. This compels us to consider more deeply than we have yet done the difference between property accounts and force accounts, and the relation between them. This can well be done by using for illustration the accounts that we are already familiar with.

Cash is a pure property or resource account. No profit or loss can be figured from it. Though the excess of cash debits over cash credits represents the excess of cash receipts over cash disbursements, it does not show whether that excess was received as proprietor's investment, as a loan, or as the profits of the business. Those things must be shown by other accounts — the accounts that were credited when Cash was debited. The same thing is true of Bills Receivable. It is a pure property account. No profit can be figured from it; for if any profit has been made in connection with the notes, that profit is of the nature of interest or of payment for risk in the acceptance of doubtful paper, and should be recorded under other heads. The same sort of thing is true of Bills Payable, except that it represents negative property, *i. e.*, debts. Interest, on the other hand, does not in any sense represent property: it merely records explanations of changes in property accounts. Every change in a property account must be explained, and if that explanation is not a mere transfer or exchange of one kind of property for another, some business force must be called in for explanation: the force that we call interest often furnishes an explanation, and this is recorded in the account called Interest. Such explanation accounts or force accounts are commonly called "nominal accounts," to distinguish them from "real," or property accounts. A nominal account, therefore, it must be clearly understood, never represents a tangible thing: the tangible thing is in a property account, such as cash, and the explanation of the change in property is to be found in a nominal account, such as Interest. The Expense Account and accounts akin to it are similar to Interest, in that they are purely nominal and record the explanations of changes in real accounts. Perhaps this can be made clearer by a problem. Suppose the "real" accounts of a firm show an excess of debits over credits amounting to \$20,000, — *i. e.*, its property is \$20,000 in excess of its liabilities. Do we know anything then about the state of its "nominal" accounts, *i. e.*, its force or explanation accounts? If the pro-

erty exceeds the liabilities, whence came that property? It cannot have been investment by the proprietor, for any investment that he has made must have been credited to him, and hence must appear among the liabilities which the property exceeds. Such excess cannot have come from loans, for such loans must also be included among the liabilities. The excess, then, can be nothing but profit or earnings; and as all profits have been registered as credits in some nominal account — *i. e.*, force or explanation account, — this excess must be so registered. The excess credits of nominal accounts must equal the excess debits of property accounts. Conversely, if the nominal accounts show a credit balance, *i. e.*, a profit, we know that the property accounts must show a debit balance, *i. e.*, an excess of property; for if the profit shown by the nominal accounts has not been made in property — cash, goods, or claims, — it has not been made at all. Although the property accounts *include* the profit that has been made, they do not register the *amount* of profit, but mingle it with investment and loans. Only nominal accounts register the amount of profit.

Merchandise Account, we have seen, is both real and nominal. So far as it represents property, that is, merchandise on hand, and it always does that when any goods are on hand, it is real; and so far as it represents profits on goods sold, and it always does that when any have been profitably sold since the last closing of the books, it is nominal. How much of the balance of Merchandise is one or the other cannot be told off-hand, and hence an inventory of stock on hand is necessary for the interpretation of this account. With such an inventory, conclusions are easily drawn. The method of interpreting a combination account like Merchandise may be shown by a simple illustration. Suppose Merchandise shows a debit total on the ledger of \$50,000, and a credit total of \$60,000. In that case it is obvious that merchandise has cost \$50,000, and that merchandise has been sold for \$60,000; but this does not mean necessarily that a gross profit of only \$10,000 has been earned, for perhaps some of the original \$50,000 worth is still on hand and therefore \$60,000 has come in from the sale of only a part of the stock. In that case, if the inventory shows a stock on hand to the amount of \$10,000, clearly \$40,000 worth of goods has been sold for \$60,000 and the profit has been \$20,000. Of the totals appearing

under Merchandise in the ledger, therefore, \$10,000 of the debit was property, and \$20,000 of the credit was profit. Only, then, by reading Merchandise in connection with an inventory can one find the significance of that account.<sup>1</sup>

An account of great importance, though usually having but few entries, is Loss and Gain, or Profit and Loss. It is, of course, as already hinted, an explanation account, measuring increase or decrease in the value of property held. No system of bookkeeping is likely to provide accounts for all sources of income or causes of loss. In fact it is hardly worth while to distinguish trivial and exceptional causes of loss or gain. They may well be lumped. Usually during the course of the year entries are made to Loss and Gain only for exceptional trivial things, though if the attempt to distinguish between different sources of income or causes of loss is not carried very far, such things as losses by bankruptcy are likely to go to this account. At the close of a year, however, it is customary to transfer to this account from the other ledger accounts all losses or gains of whatever sort and of whatever magnitude. Thus a summary of the year's business is available in simple form. Any balance undisposed of at the final settlement may continue over to the new year if the managers so desire.

The number of accounts that may be kept in a ledger is infinite. An account should be kept with every person, kind of property, and force, which if kept distinct could help to an understanding of the amount of profit, loss, or valuation, the cost of production or of service, the resources and liabilities, or the causes and sources of loss or gain.

A few illustrations of the use of these accounts as they would appear in the simplest possible form may now be given. In order to give in summary form a review of general principles up to this point, the transactions will be followed through from the day-book to the ledger.

<sup>1</sup> In some lines of business it is possible to distinguish in the record between cost price and selling price for all sales, and then two distinct accounts with merchandise may be kept, thus avoiding the necessity for reference to an inventory. Yet even in those lines of business the use of an inventory in connection with some accounts is unavoidable. So the principle here explained is essential even when it is not applied in this particular account.

## DAY-BOOK

August 1		
Borrowed of William Patterson, on my note, dated to-day, payable in four months, with interest at 6%		1000 00
[It is recommended that the reader who wishes to follow these pass at once from this entry to the corresponding journal entry, on page 31, and thence to the ledger entries, before going on to the second day-book entry here; and so on.]		
2		
John Straw paid his bill of July 2, payable to-day, by his note for \$500, dated to-day and payable in 60 ds. Discount \$5.00		495 00
Sold Oliver Twist 12 M. pine boards @ 20		240 00
3		
Sold Dombey & Son standing timber in lot #75, for cash		2000 00
5		
Took up note of Aug 1, payable to William Patterson		1000 00
Interest		67
Received from Nicholas Nickleby, in payment of his bill of July 5, due to-day, a note of Adam Bede, dated August 1, on 60 ds., for \$500,	495.33	
and Cash	75.40	570 73
Felix Holt credited for last month's salary		100 00
6		
Discounted at the Second National Bank J. Straw's note of Aug. 2. Discount \$4.67		495 33
7		
Paid F. Holt his salary to 8/5		100 00

The journal entries for these transactions follow:



## JOURNAL

[page 60]

		August 1	
9	Cash	1000 00	
15	To Bills Payable		1000 00
	[Note that William Patterson does not need to appear upon the books, for the note serves as sufficient evidence of his claim. Since the note bears interest, no discount is taken.]		
	2		
13	Bills Receivable	500 00	
	To Sundries		
43	J. Straw		495 00
20	Interest		5 00
	[Note that this entry debits Bills Receivable for the face of the note, credits J. Straw for what the note is worth today, and credits Interest with interest earned — and that interest is now recorded as earned because the safe already holds evidence of it through J. Straw's note promising to pay that interest (which is the difference between \$495.00 and \$500.00) at the end of the time.]		
39	Oliver Twiſt	240 00	
11	To Mdse.		240 00
	3		
9	Cash	2000 00	
11	To Mdse. (or, perhaps, Standing Timber)		2000 00
	5		
	Sundries		
9	To Cash		1000 67
15	Bills Payable	1000 00	
20	Interest	67	
	Sundries		
	To Sundries		
13	Bills Receivable	500 00	
9	Cash	75 40	
37	Nicholas Nickleby		570 73
20	Interest		4 67
	[Sufficient explanation of this is found in connection with the entry for Aug. 2.]		

[page 61]

JOURNAL (continued)

		August 5		
21	Expense		100 00	
44	To Felix Holt			100 00
		6		
	Sundries			
13	To Bills Receivable			500 00
9	Cash		495 33	
20	Interest		4 67	
	[Note here that interest is lost, and hence Interest Account is debited or held responsible just as in the first entry for Aug. 2 it was credited. The difference between the two amounts, an excess on the credit side, is thirty-three cents, showing that the business by holding that note for four days — that is, by what is practically lending the money for four days — earned that amount in interest.]			
		7		
44	Felix Holt		100 00	
9	To Cash			100 00

These items when posted to the ledger would look as follows:

LEDGER

BILLS PAYABLE

[page 15]

Aug. 5   Cash	60    1000 00	Aug. 1   Cash	60    1000 00
---------------	---------------	---------------	---------------

CASH

[page 9]

Aug. 1   Bills Pay.	60    1000 00	Aug. 5   Sundries	60    1000 67
" 3   Mdse.	60    2000 00	Aug. 7   F. Holt	61    100 00
" 5   N. Nickleby	60    75 40		
" 6   Bills Rec.	61    495 33		

BILLS RECEIVABLE

[page 13]

Aug. 2   Sundries	60    500 00	Aug. 6   Sundries	61    500 00
" 5   "	60    500 00		

LEDGER (*continued*)

J. STRAW [page 43]

| | || | ||| Aug. 2 | Bills Rec. | 60 || 495|00

INTEREST [page 20]

Aug. 5 | Cash | 60 || | 67 ||| Aug. 2 | Bills Rec. | 60 || 5|00  
 " 6 | Bills Rec. | 61 || | 4|67 ||| " 5 | " | 60 || 4|67

OLIVER TWIST [page 39]

Aug. 2 | Mdse. | 60 || 240|00 ||| | | || |

MDSE. [page 11]

| | || | ||| Aug. 2 | O. Twist | 60 || 240|  
 " 3 | Cash | 60 || 2000|00

NICHOLAS NICKLEBY [page 37]

| | || | ||| Aug. 5 | Sundries | 60 || 570|73

F. HOLT [page 44]

Aug. 7 | Cash | 61 || 100|00 ||| Aug. 5 | Expense | 61 || 100|00

EXPENSE [page 21]

Aug. 5 | F. Holt | 61 || 100|00 ||| | | || |

[This ledger shows only the postings of the items given. Of course previous items must be taken for granted, for otherwise J. Straw and N. Nickleby could have owed nothing to the business.]

Those who are interested to see the use of a few accounts which are less common, under circumstances of natural but infrequent occurrence, will find some illustrations of journalization for them in Appendix B.

517-25  
 1100-17  
 247006

## CHAPTER FIVE

### THE TRIAL BALANCE, THE STATEMENT, AND THE BALANCE SHEET

BEFORE we pass on to a study of the various typical methods of abbreviating the labor of keeping records, it may be well to carry these simple forms to their conclusions in a trial balance, a six-column statement, and a balance sheet; for these last devices remain unchanged in spite of all the changes of method in making original entries, and an understanding of them is an assistance in understanding the methods of abbreviation.

It has been noted all along that debits must equal credits. When an entry has many parts, it is not surprising if some part be inadvertently lost. A simple test is to add together all the debits and then all the credits of that entry, and see whether the requirement of correspondence is met. The second journal entry for August 5, on page 31, is an illustration of a case in which the bookkeeper is likely to find satisfaction in making a test. It may be worth while simply to add the total of each journal column, one debit and one credit, page by page, on the presumption that if the comparison is correct for a page as a whole it is correct for each entry. Yet even if the journal correspondence holds true, that fact is no evidence that the correspondence will hold true on the ledger, for errors in posting are not always easy to avoid. A test of the ledger may also be made, however, and usually is made under the name of the "trial balance."

A trial balance is nothing but a list of the open accounts in the ledger with an extension opposite the name of each account showing the amount of debit or credit balance (or debit and credit total, if the bookkeeper finds it easier to write both totals than to figure the difference between them). For the ledger beginning on page 32, the trial balance would look as follows, — debits being here, as everywhere, in the left column and credits in the right:

9	Cash	2470	06		
13	Bills Receivable	500	00		
43	J. Straw			495	00
20	Interest			4	33
39	O. Twist	240	00		
11	Mdse.			2240	00
37	N. Nickleby			570	73
21	Expense	100	00		
		3310	06	3310	06

The principle of the trial balance is obvious enough. Clearly the total of all credits posted to the ledger must equal the total of all debits posted to the ledger. A balance is simply the excess of one side over the other, — that is to say, the two sides are equal except for the balance. When, then, in taking a trial balance the bookkeeper omits all accounts which have no balance, and takes from other accounts only the excess of one side over the other, he is simply omitting from his test of the ledger those debits and credits which have already shown themselves to be equal and therefore beyond the need of test. If the parts tested show themselves equal, and the parts not tested are already known to be equal, obviously the totals must be equal.

In the ledger before us, since the accounts of Bills Payable and Felix Holt show no balances, those accounts do not appear. No ledger could in practice look quite like this one, for, as has been already suggested, previous transactions must have taken place, — else J. Straw and N. Nickleby could not owe the business, and merchandise could not be sold before any had been bought; but we may be sure that the previous transactions must also have had a correspondence of debit and credit, and these equal balances added to old equal balances must produce totals that are equal. So the trial balance is correct for our purpose.

It is easy either to overstate or to understate the value of a trial balance. The trial balance proves nothing; and yet by the law of chance it is very good evidence that except in two particulars the books are correct. If an error has been made in posting a debit to John Jones's account when the posting should have been made to John Smith's account, the trial balance will not indicate that anything is wrong, for the trial balance shows simply whether a sufficient amount has been debited somewhere; if, on the other hand,

John Jones has been debited when he should have been credited, the trial balance will show that something is wrong. If, again, a wrong amount is debited to some one, the trial balance will not indicate error provided the error extended to the other half of the entry and made the credit correspond; but if the error was made in one half of the entry and not in the other, the trial balance will show that something is wrong. All this, however, is on the assumption that the trial balance correctly represents the books. To draw up a trial balance from a big ledger and make it prove, even when the books are right, is no easy task. In the first place, it is easy for one to skip some ledger account entirely, by merely overlooking it, for often several accounts are on a page. Three other errors are common: in figuring a balance from the ledger; in transferring figures from the ledger to the trial balance; in footing the trial balance. Of course, these errors should not be made, but when nothing more serious than a mere test hinges upon such errors, a bookkeeper is strongly tempted to hurry unduly and find ultimately that haste has made waste.

When, therefore, a trial balance fails to prove, "to come," "to be got," as the satisfactory condition is variously expressed, the bookkeeper's first business is to see that it correctly represents the ledger, — is footed correctly, has balances correctly transferred to it, is based on correct figuring of balances, and includes all open ledger accounts. In the search for error, sometimes a clue may be found. If the difference between the debit and the credit footings is divisible by two, there is a possibility that an account of half the amount has crept upon the wrong side of the trial balance, for of course an item on the wrong side makes that side too large and leaves the other side too small, and the difference between the sides is twice the amount of the error. A mere glance up the trial balance to see whether there is any item of half the discrepancy is worth while, for if such be found upon the wrong side, — and a glance will usually indicate sufficiently to the bookkeeper on which side of an account the balance should be, — the discovery of the mistake brings the trial balance to the desired condition. Other clues are likely to suggest themselves, — such as a discrepancy showing in only one figure of the totals, due probably to an error in addition. When the bookkeeper is satisfied that his trial balance

correctly represents the ledger, his next concern is to find the ledger error, for such error there must be. Clues may suggest points to look for. Sometimes a quick comparison with last month's trial balance shows suspicious changes. The error may be in posting a wrong figure, in posting to the wrong side of an account, in adding various parts of a complicated entry so that the total posted to one side shall not be equal to the total posted to the other, in entirely neglecting to make some posting, or in posting some entry twice. If no clue leads to the discovery of error, the last resort is to go over every posting since the last trial, see that it is correct, check it inconspicuously in pencil in the ledger and its source in the journal, and then go through journal and ledger to find unchecked and therefore lost or duplicated entries. If this fails, the only thing to do is to begin at the beginning once more. If again the error fails to appear, recourse is had to the last trial balance, which, by comparison, must show where the discrepancy lies.

One thing is of utmost importance in a business of much consequence, however, and that is ultimately to get the trial balance to prove absolutely. A failure to prove shows that there is at least one error somewhere; but it may mean a dozen errors. It does not, moreover, mean that the errors are in magnitude equal to the discrepancy in the trial balance, for that discrepancy measures merely the balance of errors. A case is known where a discrepancy of one cent led to the discovery of several errors, one of which was for fifteen thousand dollars: the one cent simply measured the difference between the debit errors and the credit errors. A trial balance discrepancy means simply one or more unknown errors of unknown magnitude; and no man is willing to allow errors of that sort in his books, whatever may be the labor cost of finding them.

This is a sense, then, in which it is impossible to overstate the value of a trial balance. Yet, as already indicated, there are many errors which a trial balance will not hint at. Indeed, a trial balance may prove, and yet the books may err in the very respects which the trial balance is meant to test. This can happen, however, only when an error is made in drawing off the balance exactly offsetting the error in the books. Such a coincidence is strongly against the law of chance, and at worst could not be a permanent false security, for it would not happen through several trial balances in succession,

and soon one that failed to prove would disclose the error in the earlier one.

The preservation of trial balances is likely to be of use, for not only do they sometimes furnish clues for finding errors in the new trial balances, but they also preserve in convenient form a statement of how each account stood at convenient intervals of the past. Usually they are taken monthly.

Closely connected with the trial balance, because based upon it, though having an entirely different purpose, is the six-column statement. This purports to present a complete view of the business in summary form, showing property, liabilities, profit, and loss. Such a statement requires for its compilation nothing but the trial balance with lists of property and of unentered claims and debts. The method is simply to extend the figures of the trial balance into four new columns, one each for resources, liabilities, losses, and gains, combining with those figures the lists above mentioned. In drawing up such a statement, the bookkeeper needs to have clearly in mind the significance of the various accounts that he is dealing with. External accounts, he must remember, always indicate either resource or liability, — debit balances showing resources and credit balances showing liabilities. The internal accounts, he must remember, are of two classes, — property accounts, *i. e.*, real, and explanation or force accounts, *i. e.*, nominal. Real accounts with debit balances indicate resources, and with credit balances indicate liabilities; and nominal accounts with debit balances indicate losses, and with credit balances indicate gains. Certain of these accounts present no complications, and we may well carry them through such a statement, taking arbitrary figures that will best serve our purpose.

*Partial Six-Column Statement [cents omitted]*

	Dr.	Cr.	Resource	Liability	Loss	Gain
1 Proprietor		75,000		75,000		
15 Bills Pay.		25,000		25,000		
13 Bills Rec.	36,000		36,000			
76 J. Jones	8,000		8,000			
74 J. Smith		5,000		5,000		
21 Expense	17,000				17,000	
22 Commission		1,200				1,200
9 Cash	1,600		1,600			



So far the work consists simply in extending every debit of our trial balance into another column, resource or loss — according as the account is real, representing property, or nominal, representing a destructive force, — and every credit into either a liability or a gain column — liability if the account is real, representing a claim against the business, and gain if the account is nominal, representing a force producing profit.

When we come to accounts with which an inventory or list of accrued items is connected, however, we find more complication. We have already worked out one case of Merchandise in Chapter IV. Let us try another. This would be treated as follows:

	Dr.	Cr.	Resource	Liability	Loss	Gain
Mdse.		10,000	20,000			30,000

This account is both real and nominal. So far as it is real, we must enter in our resource column the stock on hand, determined by "taking account of stock," or \$20,000. Now it follows that, if the account has already realized from sales \$10,000 more than the goods purchased have cost it, and \$20,000 worth of goods is still on hand, the profit is \$30,000. For the goods sold, \$30,000 more was received than paid; or, to express it in another way, we have got back all we paid, plus \$10,000, and have \$20,000 worth of goods remaining. We accordingly extend the \$30,000 into the gain column. If, on the other hand, the balance according to our books were a debit of \$10,000 — meaning that we had paid \$10,000 more for goods than we had received for goods sold — and our stock on hand were still \$20,000, our gain would be \$10,000; for we should have still on hand goods worth \$20,000, which, taking everything into consideration, would really have cost us but \$10,000. The \$20,000 of stock on hand is usually written in red ink to show that it is taken not from the books but from an inventory that does not yet appear upon the books — though destined ultimately to appear upon them.

A similar thing may be true of any other property account even when not connected with buying and selling. If the firm has certain real estate which is depreciating, it may carry the item through the statement somewhat after this fashion, assuming the depreciation to be 3%.

	Dr.	Cr.	Resource	Liability	Loss	Gain
Real Estate and Plant	54,200		52,574		1,626	

Another account which may include inventories is interest. Interest is paid not daily, of course, but at intervals. If a firm pays on December 30 a large amount of interest, and knows that on January 2 a much larger amount will be due to it, a statement which is made on December 31 neglecting the interest due on January 2 does not fairly represent the facts. That interest payable to the firm on January 2, though not yet due, has been earned, with the exception of the amount for two days, on December 31; and a statement of the business for the year closing December 31 should take note of it. Interest accrued but not yet due, both for and against a business, should be inventoried whenever a statement is desired. Then the entry on a six-column statement should be made in much the same fashion as that already worked out for Merchandise. Suppose here the balance both according to the books and according to the inventory is favorable. On the statement the item might show as follows:

Interest	Dr.	Cr.	Resource	Liability	Loss	Gain
		600	100			700

The balance of earnings of interest as shown by the books is \$600, and the inventory shows that an additional balance of \$100 has already been earned by this year's business, though that interest has not yet become due and hence is not yet on the books. The total gain therefore is \$700.

If now we add to our original items on the six-column statement, as given on page 38, those that we have since worked out, *i. e.*, Merchandise, Real Estate and Plant, and Interest, we shall find our totals of each column as follows:

Dr.	Cr.	Resource	Liability	Loss	Gain
116,800	116,800	118,274	105,000	18,626	31,900

The first two columns here are nothing but the trial balance, and indicate simply that for every debit a credit has been given. The next two show that the property of the business is greater than its liabilities by \$13,274. In these liabilities, it is to be noticed, is included the liability of the business to the proprietor; hence, if the property is so much in excess of the liabilities, that excess must represent the earnings of the year. If we wish to know where that property came from, we look at the nominal or explanation accounts

and find some interesting figures. Merchandise earned \$30,000, commission earned \$1200, and interest earned \$700, or a total of \$31,900; and the cost of securing this profit was \$17,000 for expense, and \$1626 for wear and tear of real estate and plant, or a total of \$18,626. The difference between the gains and losses, therefore, is \$13,274—just the difference between the resources and the liabilities. Should the difference between resources and liabilities equal the difference between gains and losses? Inevitably. The nominal accounts are kept solely to show the causes of the changes in the real accounts, and hence they must explain just as many changes as occur: a change cannot occur in a real account, other than an exchange of one thing for another, without a nominal account recording the cause of the change. Hence the proof, by correspondence of differences, must follow. It is well to show the proof by subtracting the total of the columns at the bottom of the sheet, as follows:

Resource	118,274		Gain	31,900
Liability	<u>105,000</u>		Loss	<u>18,626</u>
Net Gain	13,274		Net Gain	13,274

For practical purposes this is perhaps sufficient explanation of a six-column statement and its principle, but certain facts yet remain which are of interest to one who wishes something better than a rule of thumb. If the question arises, How does it happen that the balancing is not thrown out by putting into the six-column statement items not on the books, such as merchandise stock on hand, accrued interest, and valuation of real estate? the answer is that these outside figures are carried also through the loss and gain columns, for the figures in the loss and gain columns are taken from combining the book figures with the inventory figures: thus the change affects both sets of figures alike.

Perhaps a more puzzling problem to solve is the reason for the apparently erratic manner in which book or trial balance figures and inventory figures are combined. Let us try all possible combinations of the books and the inventory with respect to interest. The following are conceivable cases:

	Interest	Dr.	Cr.	Resource	Liability	Loss	Gain
(Case 1)	Interest	600		100		500	
(Case 2)		600			100	700	
(Case 3)			600	100			700
(Case 4)			600		100		500

The correctness of the loss and gain figures should be clear. In case 1, the books show a loss, but \$100 will come in later: hence the net loss is less. In case 2, the books show a loss, and \$100 loss is coming later: hence the total loss is greater. In case 3, the books show a gain, but \$100 is coming in later: hence the total gain is greater. In case 4, the books show a gain, but \$100 must go out later: hence the net gain is less. The curious thing to note is that seemingly unlike things are added and like things are subtracted. In case 1, one debit, or left-hand, column of a pair is subtracted from the other debit column; in case 4, one credit, or right-hand, column of a pair is subtracted from the other credit column; in cases 2 and 3, debit and credit columns are added. This calls for explanation, since we usually add similar items and subtract dissimilar. The explanation is the rather abstract one that the inventory figures represent a different sort of thing from the book figures. This can best be illustrated by a question. What would you give for what is represented by the \$600 debit in case 1? Clearly nothing, for it represents sums consumed, paid out on account of that force in business which we call interest. What, on the other hand, would you give for what is represented by the \$100 in the resource column? It is clearly worth \$100, for it represents \$100 of claims that can be enforced.

The book figures are from mere nominal accounts, and hence are mere explanations. Yet an explanation can never be a resource. The figure of one hundred dollars in the resource column, then, is not a nominal figure, but indicates the anticipation of a real account; for if that one hundred dollars never comes in as a real thing, it will never come in at all. That expected real resource must be explained in the six-column statement now, for it belongs to this year's earnings; but, as it has not yet come in, it is not included in the trial balance. When it does come in, it will be a credit to Interest and a debit perhaps to Cash: it is now included as a credit to Interest in the gain column, and is simply placed *artificially* in the resource column to show that a real resource (probably expected cash) is explained by the credit to Interest, though that resource is just now so intangible that it can hardly be properly classified. From one point of view, then, the resource under Interest is not interest at all, but is some unknown real account temporarily called interest for want of a better name. The figure of gain opposite Interest, in case 3, for

example, is not derived from adding the \$100 in the resource column to the \$600 in the credit trial-balance column, but from adding to the \$600 an entirely different \$100 which the bookkeeper knows will ultimately be credited to interest, next year; and the \$100 in the resource column is simply the other half, representing a real account, of the expected credit to interest, and put here simply because there is no more intelligible place to put it.<sup>1</sup>

The six-column statement as a whole has now served its chief purpose, — to show a summary of the business. Usually such statements are drawn up only annually. Then, since the condition of the business has been carefully figured out, preservation of those figures on the books, in more durable shape than a separate sheet, is likely to be desirable. This can be accomplished by embodying the conclusions of the statement directly upon the ledger, that is, closing the ledger accounts and bringing down the balances. Indeed, this is necessary if the same books are to be continued into the coming year, for the affairs of the new year will attach themselves to the condition as it now stands on the six-column statement, and if the books are to tell the truth they must be brought into accord with the facts. The process of doing this is comparatively simple.

In all bookkeeping the method of closing an account that is not naturally balanced is to produce an artificial equality of debit and credit by adding to the smaller side a sum equal to the excess of the other side, and then bringing down such excess as the first entry of the new account. If, for example, cash account shows a debit of

<sup>1</sup> It is obvious that when it is desired to enter upon the books the details of allowances and inventories here recorded, the result may be accomplished by opening accounts in the ledger with the items concerned. For example, instead of entering the accrued interest in red ink under the head of Interest, an account may be opened with Accrued Interest, which may be debited, with a credit to Interest, and the amount may be carried through the six-column statement. On the statement, then, the Accrued Interest would show as a resource (a real account), and Interest would show as a gain (a nominal account). This plan avoids the theoretical complication explained above; but it has one disadvantage. Under this plan the balance of Accrued Interest continues on the books indefinitely until canceled by a new entry. So watch must be kept and an entry made whenever accrued interest becomes due. Under the other plan, described in the text, the payment of interest automatically wipes off the item of accrued interest, for, going to the same account, the debit and the credit offset each other. In some lines of business, as explained in Part II, it is necessary to distinguish three sorts of interest, — Interest Accrued, Interest Earned, Interest Due; but the principle is the same throughout.

\$17,000 and a credit of \$15,400, the excess of debit is \$1600. An artificial balance or equality is struck by adding to the credit side \$1600, which should be considered not as a credit but as simply a means of recording the measure of debit excess. Then the two sides are added, the totals written in the book, the proper rulings made, and the debit excess brought down to the new account, thus:

CASH					
Jan. 1	Balance			8000	00
13	Bills Rec.	27		6000	00
26	Bills Pay.	29		3000	00
				17,000	00
				1600	00
Feb. 1	Balance				
				2000	00
				30	3000
				30	5000
				30	5400
				<i>Balance</i>	<i>1600</i>
				17,000	00
				17,000	00

The balance artificially inserted, as here \$1600 on the credit side, should be written in red ink or have some other distinguishing feature, that the eye may note that it is not an entry but is placed in the account artificially to serve the purposes of balancing. Strictly speaking, the \$1600 brought down to the debit of the new account is not the \$1600 written in red ink on the credit side: the \$1600 in red ink is merely a memorandum to determine the debit excess, for, since on the books subtraction can never be performed, the only method of showing excess is to show how much must be added to the smaller side in order to produce equality. Hence the \$1600 brought down is simply the debit excess brought down where it naturally belongs, in a debit column.

The figure of totals of the two sides, \$17,000 in the case above, is not an essential, and is often omitted. Yet a case is known where the omission of those figures cost the loss of more time than the writing of such figures in all closed accounts would probably have cost in many years. The story is worth telling because it illustrates several important principles of careful bookkeeping. A bookkeeper had worked several days over his trial balance, following every clue that he could find and then checking his work over. Everything appeared correct, but a discrepancy of \$8.40 persisted. A friend happened into the office, was told of the difficulty, and volunteered a few moments' assistance. He began, with the bookkeeper, to compare the trial-balance sheet with the ledger. The bookkeeper was

about to turn over a certain ledger page, on the ground that it contained no open accounts, when the friend remonstrated. He noticed that the accounts were ruled as if closed, but that the figures of totals were not written. A moment's figuring showed that one of those accounts, though ruled, did not balance by \$8.40 — just the amount of the discrepancy in the trial balance. The bookkeeper insisted that the account ought to balance, for the customer had paid all that he owed. The investigation that followed showed a curious state of things. In the settlement of the account had been included a discount of \$8.40, which should have been credited to the customer; but by some chance the entry was never made. When the bookkeeper, knowing that the account had been settled, had posted the cash payment that settled the account, he proceeded without further formality to rule the account as closed. Had he added the figures of the account as he should have done, he would have seen that the account was not balanced, and the omission of discount would have been discovered. The result was that the account of the customer was related to the trial balance as it should have been, though not as the books warranted; but the discount account was wrong to the amount of \$8.40, not only upon the trial balance but also on the books. Although there were two errors in the books, there was but one absolute error in the trial balance. It was only because the bookkeeper's friend was suspicious of such slipshod closing of accounts that he was able to find the error. There is no knowing when the bookkeeper himself would have found it. Before an account is ruled the bookkeeper must be sure that it balances; and he must be sure, not by figuring the items on another piece of paper, but by using the identical marks of the pen that he finds in his ledger, for the marks on his paper may not be the same as those in his ledger, — as is shown by the case above. One should never add a column of figures and then transfer the total as the footing of another column of figures, even when one thinks they are alike. Of course the actual writing in the ledger of the total of ledger footings is not essential, for correspondence is all that is needed; but the appearance of them upon the page is a satisfaction to the eye and requires little labor.

When accounts shall be closed is a matter solely of convenience. Sometimes when a settlement is attempted and some matter is in dis-

pute, convenience suggests that the amount in dispute be preserved on the record by the closing of the account and the carrying down of the disputed balance as the first item of the new account. Often, even at the end of the year, it is not worth while to close an account, for the items on it may be so few or so simple that the account is sufficiently intelligible as it stands. It is usually desirable, however, to close at the end of the year all accounts showing loss or gain, and in the case of corporations which intend to pay dividends this is practically necessary. This is most simply done by transferring to the ledger in red ink all red-ink items of the six-column statement, and then transferring the balances of those accounts to Profit and Loss, and ultimately transferring the Profit and Loss balance to the Proprietor's account, to Dividend account, or to Undivided Profits account. This may be illustrated by using the figures that we already have in our six-column statement, and assuming, for simplicity, that the balances that we find on the trial-balance part of the statement happen to be the only entries under each account. These will be best understood if the reader, as soon as he finds that any entry has been carried to the Profit and Loss account, turns to that account and notes how the item is there treated.

## EXPENSE

		<u>17,000</u>   <u>00</u>		<i>Profit &amp; Loss</i>   L25		<u>17,000</u>   <u>00</u>
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[The index figures in these illustrations will be omitted, except for the new entries which the illustrations are designed to show. The page index number in italics is to show the ledger page to which the item goes, and, conversely, in the Profit and Loss account, below, it shows from what ledger page the item comes. The principle of carrying forward the balance is the same here as in the cash account (see page 44).]

## COMMISSION

		<i>Profit &amp; Loss</i>   L25		<u>1,200</u>   <u>00</u>				<u>1,200</u>   <u>00</u>
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## MERCHANDISE

		<i>Profit &amp; Loss</i>   L25		<u>30,000</u>   <u>00</u>				<u>10,000</u>   <u>00</u>
				<u>30,000</u>   <u>00</u>				<u>20,000</u>   <u>00</u>
Jan. 1	Balance			<u>20,000</u>   <u>00</u>				<u>30,000</u>   <u>00</u>

[Here we find a new type, though the principle is the same. The ledger does not ordinarily show the goods on hand, for Merchandise is a combined real and nominal account. Here the separation of the two elements must be made. When we close Merchandise account, to determine its responsibility to us or ours to it, we must clearly take into consideration the goods that it still



## TRIAL BALANCE, STATEMENT, AND BALANCE SHEET 47

has on hand: we charged Merchandise with them originally, and we must now, in making a settlement, at least temporarily give credit for them. Their amount is accordingly written in red ink to show that the item comes from outside the books. When this has been done, we find that the excess of credit over debit is \$30,000, and we know that Merchandise has yielded that amount of profit — has by that amount produced more than it has cost. This is transferred to Profit and Loss as in the other cases. The balance brought down for Merchandise itself is of course simply the \$20,000 worth of stock on hand, with a debit of which Merchandise must begin the new year since the warehouse is still responsible for it. To summarize this treatment of Merchandise: the \$20,000 brought down as a debit for the new year is simply that part of last year's debit to Merchandise which the account, as a property account, has not yet got rid of responsibility for; and the \$30,000 carried to Profit and Loss is the profit on last year's sales which the account, as an explanation account, last year recorded.]

### REAL ESTATE AND PLANT

		54,200 00		Inventory		52,574 00
		54,200 00		Profit & Loss	L25	1,020 00
Jan. 1	Balance	52,574 00				54,200 00

[Here we have a loss, caused not by bad buying or bad selling, but by a natural depreciation. We simply reduce the valuation brought down to the new year — a process called "writing off."]

### INTEREST

	Profit & Loss	L25	700 00		Accrued		600 00
			700 00				100 00
Jan. 1	Balance		100 00				700 00

[In this case we have something of a new type, though again we have the old principle. It may look at first sight as if it were unfair to ask Interest to begin the new year with a handicap of \$100.00 against it. When one realizes, however, that the interest has been earned this year, and will come in only next year, one sees that next year's Interest is responsible to collect that sum and is properly charged. When that interest is paid, Interest will be credited; and the difference between that credit and the debit balance carried over to the new year will properly represent next year's earnings of interest on that score — and that is what next year's interest account should represent.]

Note that a sum in red ink when transferred or brought down always goes to the other side; for its occurrence in red is an indication that it is inserted artificially either as a measure of the excess of the other side — as here with the profit and loss item, — or as an anticipation of an item on the same side — as here with the accrued item. When it measures excess, the amount must be brought down on the side that is in excess, *i. e.*, on the other side, as is done with the profit and loss item here when transferred to the profit and loss account. When it anticipates an item on the same side, that item, being anticipated, must be corrected or nullified whenever it shall occur, and such nullification can be made only by an entry on the other side; so here the accrued item is brought down to nullify the credit to interest when it shall occur on next year's account.

If the accrument were against the firm, instead of in its favor as here, the item of accrument in red would be on the debit side, of course, and would be brought down as a credit balance to the new year. Since in that case next year would have to pay the sum for this year's business, it is right that a credit should be given it at the start to nullify that apparent burden.]

## ACCOUNTS

## PROFIT AND LOSS

Expense	L21	17,000 00	Commission	L22	1,200 00
R. E. & Pl.	L10	1,626 00	Mdse.	L11	30,000 00
Proprietor	L1	13,274 00	Interest	L20	700 00
		<u>31,900 00</u>			<u>31,900 00</u>

[The L with the index page-figure is used here to show that the item comes not from another book but from the ledger itself. Transfers to this account, since the items now belong here, are in black. Transfers from it are in red.]

## PROPRIETOR

Balance		88,274 00	Profit & Loss	L25	75,000 00
		<u>88,274 00</u>	Balance		13,274 00
					<u>88,274 00</u>

[Another method of closing the books, with the advantage of giving full explanations, though it is more laborious, is shown in Appendix B, II.]

When all this has been accomplished, the books are said to be closed. It is to be noted that now, for the first time since the last closing of the books, do the accounts show the actual condition of the business. Profit and expense have been going on every moment, and a dozen bookkeepers probably could not write fast enough to keep up with the accruing of interest, the expiration of insurance, the wear and tear of plant, the depreciation and the profit in merchandise. Bookkeeping does not pretend to record all matters as they occur, but usually only as distinct elements reach their culmination. If the business has a sole proprietor, every loss or gain made on January 2 is his as much at that time as it is on December 31 when the books are closed. It should be remembered, therefore, that except when the books have been brought up to the moment by closing as indicated here, they do not quite faithfully report conditions.

If the business is conducted by a corporation, a slightly different method of closing will be required. A corporation knows no stockholders as individuals: it knows them only as holders of stock certificates; and hence accounts are kept not with individuals but with capital stock, with dividends, with profits, and sometimes with surplus. When the end of the year has been reached and a statement has been made, the disposition of the net earnings will determine the bookkeeping entries. Dividends are usually declared some weeks before they are to be paid. In that case the dividends owed to stockholders form a liability of the business, and the profit and loss account, instead of being closed out to the proprietor, as in

the case above, is closed out, at least to the amount of the dividends, to the dividend account, which will show a credit. When dividends are paid, Dividends is debited, as responsible, and Cash is credited. If the dividends do not require the full amount of the profits, the balance may be carried to "Surplus," to "Undivided Profits," or it may remain undisturbed in Profit and Loss. Some remnant usually remains after dividends are declared, unless they are declared in excess of earnings, for practically never can the profit be divided exactly by the number of shares, and most corporations desire to keep at least a small reserve. The balance undivided, under whatever account it appears, will show as a credit, for it indicates stockholders' profits intrusted to the business.

In case the statement shows a loss, — or, in the case of a corporation, if the dividends exceed the profits, — the bookkeeping is equally simple. The profit and loss account will show a debit, and that debit will mean that the investment of the proprietor or of the stockholders in the business is less valuable than at the time of the last closing of the books. In the case of the proprietor, that debit balance is transferred to his account, and the closing of that account shows him to have a reduced present worth. In the case of a corporation, the balance is allowed to remain undisturbed, representing the impairment of capital. Though not a resource in the ordinary sense, this figure of loss, this deficit, is a bookkeeping resource, for it enables the business to satisfy its accountability: it furnishes an explanation of what has become of the capital of the corporation, just as a receipt for an authorized payment for charity is a resource for an agent intrusted with property.

It is to be noted that a trial balance taken from the books as they now stand will be very different from the one taken for the six-column statement. Such a trial balance, moreover, if extended into a six-column statement, will yield nothing for the last two columns, and for the other two will simply duplicate itself. All the nominal accounts save one — and that one, Profit and Loss in the case of a corporation, is in a sense no exception — have disappeared. There is no longer anything to explain, for the business has settled with its proprietors, transferring the title to its gains and rendering account for its losses. All that remains is simple liability to proprietors and outsiders on one hand, and simple property with which to meet

that liability on the other. Even the profit and loss account, in the case of a corporation, now represents liability of the business to the stockholders because of profits, just as Capital Stock represents its liability to them because of their investment. It is true, of course, that at all times the profit belonged to the stockholders, but not until now has it been known formally to be profit and ultimately assignable to them.

The new trial balance taken after the closing of the books, then, is simply a statement covering the solvency of the business — it compares resources and liabilities, showing them to be equal. How sound a business may be, however, is determined not so much by the equality of the footings as by the availability of the resources to meet the liabilities. A Profit and Loss credit, representing the undistributed earnings available for stockholders, is an element of strength from the point of view of outside creditors, for since those earnings have not yet been assigned to individual stockholders, they constitute resources to which outside creditors may look for the payment of their claims. The exact significance of this profit and loss balance is important, but easily lost sight of by one unfamiliar with accounts. Even in this new trial balance, taken after the books have been closed, it is a nominal account, not a real account. It simply serves as a measure, or register, to show how much of the property of the business is in excess of the already recognized claims. It is the margin of solvency.

Trial balances taken after the books have been closed, and serving, as just indicated, to show solvency, are commonly called balance sheets, and hereafter will be so designated in this book. Such sheets are usually arranged not in parallel columns but with the items grouped, so that the figures derived from the books already illustrated would look as follows:

*Balance Sheet*

Resources		Liabilities	
Real Estate & Plant	52,574	Proprietor	88,274
Bills Receivable	36,000	Bills Payable	25,000
Cash	1,600	J. Smith	5,000
J. Jones	8,000		
Interest	100		
Merchandise	20,000		
	118,274		118,274

The nature of the trial balance, of the various parts of the six-column statement, and of the balance sheet, may well be summarized at this point so as to show the relationship between them. The purpose of the trial balance, as the name suggests, is to test the accuracy of the books — for equality of debits and credits. This trial balance, moreover, is used as the basis for the six-column statement, for it shows exactly how the books stand at the close of business, — and hence the first two columns of the statement are a duplicate of the trial balance. The next two columns of the statement, showing resources and liabilities (not necessarily as on the books, but making allowance for matters not yet on the books), are intended to show the facts of solvency. The last two columns of the statement, showing losses and gains (not necessarily as on the books, but making allowance for matters not yet on the books), show the facts of revenue. The only way to make the books serviceable for use next year is to bring them up to the times by entering upon them the allowances indicated for the close of the year in the last four columns of the statement, and then disposing of the net profit or loss thus shown. This process closes the books. A trial balance taken after the books are closed is the balance sheet; and except for the changes due to the disposition of profits it should agree exactly with the second pair of columns (resources and liabilities) of the six-column statement.

One other set of illustrations, to comprise practically every type of allowance and a different disposition of profits from that previously made, may be worth while, presenting the whole genealogy of the balance sheet in a comprehensive view.

<i>Trial Balance</i>		
	Dr.	Cr.
Cash	5,500	
Real estate	20,000	
Merchandise	17,000	
Expense	8,000	
Commission		700
Interest	500	
Rent		300
Capital stock		50,000
	51,000	51,000

## ACCOUNTS

*Six-Column Statement*

	[By the books]		[Solvency facts]		[Revenue facts]	
	Dr.	Cr.	Resource	Liability	Loss	Gain
Cash	5,500		5,500			
Real estate	20,000		19,500			
Merchandise	17,000		35,000		500	
Expense	8,000		1,200		6,800	18,000
Commission		700	250			
Interest	500			100		950
Rent		300		200	600	
Capital stock		50,000		50,000		100
	<u>51,000</u>	<u>51,000</u>	<u>61,450</u>	<u>50,300</u>	<u>7,900</u>	<u>19,050</u>
			<u>50,300</u>			<u>7,900</u>
		Net gain	<u>11,150</u>		Net gain	<u>11,150</u>

[Estimates are now made of values on hand.]

[The resulting gain or loss is then obvious.]

[Since in closing the books at this point the allowances are entered and the loss and gain items are closed out to dividends and surplus, the obsolete valuations and the old revenue facts are removed from active standing and only those that pertain to the new year remain as balances. For instance, \$8000 was spent last year on account of expense, but \$1200 of that is found now to be unconsumed (perhaps unexpired insurance, as no separate account is kept for insurance), and so \$1200 properly belonging to next year, though spent this year, is brought down as a balance for the new year to carry. Conversely, though \$300 was collected for rent last year, only one third of that has expired, and \$200 of it belongs to next year. That amount is brought down as a balance to the credit of the new year. Since, moreover, the new year has been given that credit, it is responsible to supply the equivalent, and hence on the balance sheet this amount is a liability: to put this somewhat differently, since the old year turns over to the new all receipts (such as the balance of cash collected from that rent), the new year must be held accountable also for the equivalent — to supply the quarters or to refund the money. When a new trial balance is taken of the books as they now stand closed, the result is as follows: ]

*Balance Sheet*

Resources		Liabilities	
Cash	5,500	Interest	100
Real estate	19,500	Rent	200
Merchandise	35,000	Capital stock	50,000
Expense	1,200	Dividends	5,000
Commission	250	Surplus	6,150
	<u>61,450</u>		<u>61,450</u>

## CHAPTER SIX

### LABOR-SAVING DEVICES

THE most obvious improvement that can be made over the primitive books described in Chapter III is a combination of the day-book and the journal in one book. No purpose is served by their separation. At least the turning of pages may be saved. When the combination has been made, the combined book is usually known as the journal. The simplest combination is made by writing the journal entry, or "journalization," as it is commonly called, directly beneath the day-book entry. This is also the most logical combination, for a bookkeeper would naturally wish to have the detailed history before him when he is journalizing. One difficulty with this arrangement is that, in posting, the eye of the bookkeeper must be careful to detect exactly where the journal entry begins, or he may omit some item from the ledger. This extra care, in separating the day-book portion of the entry from the journal portion, means less rapidity in posting. A more common form of combination, therefore, puts the journalization first, with the day-book entry immediately beneath. The following may serve as an illustration:

May 30

	Sundries				
	To Sundries				
63	Henry Esmond	1,012	00		
20	Interest	5	00		
11	Mdse.			300	00
12	Delivery Equipment			217	00
13	Bills Receivable			500	00
	Sold Henry Esmond the following:				
	100 M. Cedar shingles #1 @ 3	300.00			
	Second-hand wagon and harness, from stable	217.00			
	His own note for \$500 dated Apr. 30, on 3 mos. (less discount \$5.00) taken up by him	495.00			

Here no delay is suffered in posting, for the bookkeeper finds conspicuous the items that he wishes to post.

Still a third form of combination is in use. This consists of a parallel arrangement, and can be well illustrated by the transaction just given in the other form.

		May 30		
63	Henry Esmond	Sold him:	1,012	00
11	To Mdse.	100 M. Cedar shingles #1 \$3.00		
13	To Bills Rec.	His own note, 4/30, 3 mos., taken up by him,		300 00
20	Interest	less discount	5 00	500 00
12	To Deliv. Equipment	Wagon and harness from stable		
			217	00

[Interest is debited here because Interest was credited when the note was originally taken, on the ground of expected profit, and now that the chance of profit is lost by the taking up of the note Interest must be debited to offset the previous credit.]

This form is much more concise than the other, and shows more closely the connection between the journalization and the detailed record, but in such complicated entries as this it is not always easy to arrange intelligibly. Credit items are indicated not only by the position of the account, in the right-hand figure column, but also by the word "to" prefixed to the name of the account. For simple transactions, such as the receipt of a note or the allowance of a discount, — and in practice most journal entries are of that sort, — this form is very convenient, and is coming to be widely used.

The next step in the saving of labor is an important one, for it embodies a new principle which may be extended almost infinitely. In most mercantile business, at least two accounts, Merchandise and Cash, are of continual recurrence. Obviously, if the items of these sorts could be tucked away by themselves for a while and posted in lump sums, one posting for perhaps a hundred items, the advantage would be very great. This can be accomplished by the provision of special columns in the journal, — one for Merchandise, Dr., one for Merchandise, Cr., one for Cash, Dr., and one for Cash, Cr. All other items would appear in the usual columns, and would be posted in the usual way. Such a journal might look as follows:



Mdse., Dr.	Cash, Dr.	Sundries				Sundries.	Cash, Cr.	Mdse., Cr.
8 00			✓	Mdse.	Bo't 2 Cords Oak of			
			✓	To Cash	David Grieve, @ 4		8 00	
	2 00		✓	Cash	Retail sales at			
			✓	To Mdse.	yard			2 00
120 00			✓	Mdse.	20 C. Walnut, @ 6	120 00		
			50	To J. March				
		247 00	15	Bills Pay.	Our note of May 7			
			97	To H. Barr	paid by him	247 00		
128 00		128 00	11	Mdse. Dr.	Total			
	2 00	2 00	9	Cash Dr.	"	2 00		2 00
			11	Mdse. Cr.	"	8 00	8 00	
			9	Cash Cr.	"			
		377 00				377 00		

[This arrangement practically posts, though not in the ledger, Merchandise and Cash merely in the act of entering them, and the totals may be carried to the ledger at the end of the month or the page. Note that in the check column, before the names of the accounts, ledger-page numbers are not used for Merchandise or for Cash. It is desirable to have all items checked, but as these are posted only in total at the foot of the column, the post-mark should not appear except with the footing. The blank check mark is used to show that the bookkeeper has looked to see that the item has appeared in the proper special column. If a figure should be omitted entirely from a column, or should go upon the wrong side, the trial balance would go wrong, and so the footings of the merchandise and the cash columns are carried into the general columns, and added with the other items, merely to test the balance of total debit and credit.]

To summarize this special-column journal, or columnar journal, as it is sometimes called, we find that it is like the ordinary journal, except that the postings for two accounts are, by a temporary setting aside of the items, posted in totals only, those totals being written at the foot of the journal page with appropriate explanations. It is to be noted, of course, that this temporary setting aside does not always apply to a complete entry, but only to that part of it which is Merchandise or Cash. If one half of an entry is Cash and the other half Bills Receivable or the account of a customer, the half not Cash is treated as usual.

The principle here used may be applied to any account and any number of accounts. The only limit is convenience. It would be more work to provide and maintain a special column for an account having an average of two entries per page than it would be to post those entries individually.

It is worth while to go on and see in what ways this principle of the special column is commonly applied in business practice, for the saving that it has made possible is almost beyond the belief of the uninitiated.

One application of this principle is nearly universal, consisting in the separation of the cash book from the journal. The cash book is simply a supplementary journal, containing nothing but entries of which one half is cash. In other words, the two special columns given to Cash in the special-column journal are taken entirely out of that journal and kept in a separate book, and with the cash portions of each entry are carried also the other half of such entries—that is, the items to be credited when Cash is debited, and *vice versa*, as can be seen below. The idea of separation is carried so far, also, as to put all Cash, Dr. items on one page—the left,—and all Cash, Cr. items on the opposite page. Cash entries can now be made very simply, for no indication need be made of the fact that half of the entry is cash. The presence of the entry on the cash book shows that Cash is concerned, and the page, right or left, indicates whether Cash is to be debited or is to be credited. A cash book, accordingly, may look like this:

Left-hand page]		Receipts			
Aug. 10	13	Balance		3,549	27
	76	Bills Receivable	#327 paid		643
	11	J. Jones	His invoice, 8/2, paid		247
	15	Bills Payable	Borrowed on #27		1,000
	74	H. Smith	His acct. to balance		611
	9	Cash, Dr.	Total rec'ts	2,502	08
				6,051	35
		[This space is left blank for reasons explained below.]			
		Balance		6,051	35
				630	85

[The balance brought down for the new month is taken from the credit or disbursements page, which see.]

		Disbursements		[Right-hand page	
Aug. 10	55	B. Robinson	Paid on acct.	1,000	00
	15	Bills Payable	Paid #21	1,500	00
11	21	Expense	Stationery, H. M. & Co.	62	00
	21	Expense	Printing, Minerva Press	24	00
	23	Freight	On invoice, L. K. & Co.	73	00
12	21	Expense	Postage, stamped envel.	85	00
	23	Freight	On invoice, J. L. M.	53	00
	53	K. Pickard & Co.	Paid them in full	2,623	50
	9	Cash, Cr.	Total disbursements	5,420	50
		Balance		630	85
				6,051	35

The full principle of this form of book may be summarized in a very few words: this book is simply a part of the general journal; it contains all entries involving cash, and contains not only the cash part of those entries but the other half as well, one writing of the figures serving both entries; the receipts page contains all Cash debits, and hence all amounts appearing on that page except the total must be posted to the credit of the accounts named, for those accounts are to be credited for bringing in cash; of course the contrary is true on the credit page; at the end of the month or the foot of the page the total of the receipts may be posted to the debit of cash, and the total of the expenditures to the credit of cash.

It is desirable to show the balancing of the book by providing that the corresponding totals, 6051.35 in this case, shall be on corresponding lines on the opposite pages. Yet it is undesirable to leave blank lines on either side, for in such case no assurance appears that items were not or may not be inserted after the book was balanced. The old-fashioned way to escape the difficulty is to draw diagonal red ruling across all blank lines left on either page. This is effective, but the various slants of glaring red lines produce a page that is somewhat offensive to any one with an eye for form. A satisfactory substitute is the method employed here. The total of the short side, here the debit, is taken on the first blank line, and is then repeated, as if it were a new total, on the desired line opposite the corresponding figure on the other page. Thus the only blank lines are left between two totals that must correspond; and any insertion advertises itself as out of place. This device is equally serviceable for closing the ledger, though since the ledger is not a book of original entry, blank spaces are not necessarily to be avoided.

Many business houses do not bother to post cash at all, but when drawing up a trial balance turn to the cash book to obtain the figure for Cash. The only objection to this is that the ledger, which is theoretically supposed to show a full summary of the business, fails to do that if Cash is omitted. Only two postings a month are involved in keeping Cash in the ledger, and merely for the sake of completeness it seems well worth while to post Cash. If Cash is to be posted, however, care must be taken that the balances are not posted, for those have already once been included in the receipts of the preceding page or period. On the receipts side a separate column

for the balance keeps it out of the total until after posting is done, and on the disbursements side the total may be taken before the balance is added. The principle of closing and balancing, which is the same for the cash book as for the ledger, has already been explained on page 44. A comparison of the cash-book balance with the actual cash on hand is a valuable check on error.

When a transaction involves several parts, of which some are cash and some are not, it is necessarily divided between the general journal and the cash book. If, for example, a customer pays his bill in part by cash and in part by a note, Cash is debited and he is credited in the cash book for the amount of cash, and Bills Receivable is debited and he is credited on the general journal for the note. When both items are posted, the customer's account shows credit for the proper amount.

We have seen that sometimes both halves of an entry may be included in totals, so that neither need be posted by itself, — as in the purchase for cash and sales for cash on the columnar journal, page 55. There fifty sales for cash would require but two postings, one total for Merchandise, Dr., and one for Cash, Cr. This same principle may be applied to the cash book. In the cash disbursements given on page 56 are three items of expense and two of freight. If such items are frequent, they may well be given special columns so that they will need to be posted but once each month. We have already by the device of a separate book or column for cash provided that at least one side of all cash entries may be neglected in posting except for monthly totals; and now we find that so far as certain kinds of entries occur often enough to be worth special columns, we can provide that also the other half of those cash entries may be posted in monthly totals. Such a special-column cash book might look as follows, using the items already given on the disbursements side of the simple cash book:

Disbursements

		Sundries	Expense	Freight
Aug. 10	55	B. Robinson	Pd. him on acct.	1,000 00
	15	Bills Payable	Paid #21	1,500 00
11	✓	Expense	Stationery, H. M. & Co.	62 00
	✓	Expense	Printing, Minerva Pr.	24 00
	✓	Freight	On invoice, L. K. & Co.	73 00
12	✓	Expense	Postage, stamped envel.	85 00
	✓	Freight	On invoice, J. L. M.	53 00
	53	K. Pickard & Co.	Paid them in full	2,623 50
	23	Freight	Totals	126 00
	21	Expense	Totals	171 00
	9	Cash, Cr.	Total disbursements	5,420 50
		<i>Balance</i>		630 85
				6,051 35

[The use of check marks here is the same as has already been explained in connection with the special-column journal. In this type of book, if cash is to be posted, the transference of the totals of special columns to the general column is a necessity, not a mere convenience as in the special-column journal, for here, unless these totals are included in the general column, the total credit to Cash will not be adequately stated.

The same general principle of special columns is, of course, applicable to the receipts side of a cash book: a special column might there be useful for Bills Receivable, for example.

It is desirable not only in this book but in others that the column for ledger-folio numbers shall be full when posting is finished, with blank checks if no others are required, for then the eye sees at a glance that the posting for that page is complete.]

Similar to the cash book in principle are two books for merchandise, corresponding exactly to the Merchandise, Dr. and Merchandise, Cr. columns of the special-column journal. The book for Merchandise debits is, of course, the invoice or purchase book, and that for Merchandise credits is the sales book. These are very simple in form. In each book a record is made of the purchases or the sales, showing at the head of each item the name of the business house to be credited or debited, and showing in a column kept clear for the purpose the net amount of each invoice or sale. In posting, each account is debited or credited for the net amount of the bill, and at the end of the month the totals of all bills are posted to Merchandise, — to its debit or its credit as the case may require.

A sales-book form might look as follows:

	Sundries				
	To Merchandise				
	January 1				
97	Silas Lapham				
	25 Tons Lehigh Egg	7 00			
	Carried over			175 00	
				175 00	

		Brought over			175 <sup>00</sup>
84	Paul Pry				
	8 T. White ash stove		6 <sup>00</sup>		48 <sup>00</sup>
69	Peter Stuyvesant				
	10 Cords Walnut		8 <sup>00</sup>	80 <sup>00</sup>	
	Less 5 %			4 <sup>00</sup>	76 <sup>00</sup>
11	Merchandise, Cr.				<u>299<sup>00</sup></u>

[The only precaution required here is to see that nothing but net amounts gets into the last column. Subtraction, such as in the charge to Peter Stuyvesant, should never be done there, for the total of everything in the column is the credit to Merchandise, and the bookkeeper in posting the debit items will look in this column for the amount to be charged to the customers.]

The purchase book is identical in form, — though, of course, in posting, Merchandise is to be debited and the other accounts are to be credited. Many business houses paste their bills into their invoice books as an easy way of making entries; others file their bills and for the detailed entry in the invoice book simply refer to them by number.]

Special columns may be applied to the purchase and the sales book as well as to the cash book, of course; but usually little advantage would be derived from such a device, for unless most of a firm's purchases are made from a few sellers, or unless most of its sales are made to a few buyers, the frequency of transactions with any particular house would be too slight or the number of special columns required would be too great.

As soon as our cash book, purchase book, and sales book come into use, our journal shrinks in ordinary mercantile business to small dimensions. Only items which are neither cash nor merchandise can then go thither. There is much for it to do, however; for many things, such as payment of debts by notes, discounts not given in cash, and credit for services, can go nowhere else.

Since the books already described are in almost universal use in mercantile establishments, and since the number of details about them may seem to have made a jumble of incomprehensibility to the uninitiated mind, it may be well to summarize the situation as it now appears.

The ultimate destination of all items, either individually or in total, is the ledger; and items get into the ledger by posting from the cash book, the purchase book, the sales book, and the journal. A complicated transaction may involve so many parts that it must

be divided, — possibly even into four parts, one for each book; but, in any case, each part must preserve a balance of debit and credit, for no item can go into any one of these books without presenting in that book a debit for every credit, and *vice versa*. By the mere fact of appearing on the debit side of the cash book an item is debited to Cash and is credited to some other account named; for when the bookkeeper posts his books, he posts the total of the page, less the balance, to the debit of Cash and posts all individual amounts to the credit of the accounts named. By the mere fact of appearing on the credit side of the cash book an item is credited to Cash and is debited to some other account named; for, when posting is done, the total of the page, less the balance, is credited to Cash and the individual amounts are debited to accounts named. By the mere fact of appearing on the purchase book an item is debited to Merchandise and is credited to the account named, for the total of the purchases is posted to the debit of Merchandise and the individual items are credited to the accounts named. By the mere fact of appearing on the sales book an item is credited to Merchandise and is debited to the account named, for the total of the sales is posted to the credit of Merchandise and the individual items are posted to the debit of the accounts named. On the journal, too, a debit item must have its corresponding credit, and *vice versa*; but both accounts are specified, as our journal now stands, for we have removed all the special columns and carried them to special books. Absolute correspondence of debits and credits is assured; and the need for this is fundamental, for, if it fails, something is unexplained, and the purpose of accounting is not only to record changes in property but to explain those changes. So far as special columns have been introduced into special books — as an Expense column in the cash book — there is no serious complication, for the special column here means simply that instead of posting each individual item, as individual items on the cash book are usually posted, these particular individual items are lumped at the end of the month.

A moment's consideration will now show why double entry does not involve double work. Thirty items of sales will require how many postings? Not sixty, but thirty-one; thirty for the customers and one for the Merchandise. So far as we use special columns,

moreover, thirty items may not require even thirty postings; for if our thirty items are cash expenses, two postings will do all the work, — one to Cash and one to Expense.

An interesting complication exists in the use of both a sales book and a cash book when a cash sale is made. It is always desired that all cash should go upon the cash book; it is often desired that all sales shall go upon the sales book, simply in order that the record may be complete in one place. To enter the item under the usual plan, however, is to cause it to be posted twice to each account: for on the cash book it will be included in the total receipts and hence posted to Cash, and at the same time will be posted, as all individual items are posted, to the credit of the account yielding the cash, which is here Merchandise; and on the sales book it will be included in the total sales and so be posted as a credit to Merchandise, and at the same time will be posted, as all individual accounts are posted, to the account causing the outgo of Merchandise, which is here Cash. Thus both halves of the entry are posted twice. This, however, can be easily avoided. Suppose we in each case head off one posting. We can hardly with ease provide that the item be omitted from totals, but we can provide that the individual part of each entry be passed without posting. If at the time of entry in the cash book we check the item with a blank check mark (✓) in the posting-check column, it will not be posted thence as a credit to Merchandise, and if in the sales book we check the item in the same way, it will not be posted as a debit to Cash. The result is that from the cash book, the item, included in totals, is posted to Cash and not at all to Merchandise, and from the sales book, included in totals, it is posted as a credit to Merchandise, and not at all to Cash. Thus is the desired duplication avoided. This sort of use of the blank check (✓) is a great convenience in many ways.

Sometimes two accounts are kept with Merchandise, — one, called Merchandise Debits, to represent purchases, though credits may be made to it, and the other, called Merchandise Credits, to represent sales, though debits may be made to it. Obviously when we return goods as unsatisfactory, we are not making a sale; and when we receive goods returned by customers who have taken goods for examination, for instance, we are not making a purchase. This distinction of Merchandise Debits from Merchandise Credits, ac-



cordingly, preserves the figure of actual sales and actual purchases, and furnishes important statistics of the business actually transacted, though in ultimate profit or loss or valuation it makes no difference, of course. In order to carry out this principle thoroughly and avoid unnecessary labor, many concerns keep books especially for returned sales and returned purchases, posting the total of returned sales to the debit of Merchandise Credits, and the total of returned purchases to the credit of Merchandise Debits. Sometimes these accounts are called simply "Purchases" and "Sales." The same principle may be applied to other accounts that may be divided with advantage.

So far none of our devices for labor-saving has applied to the ledger. Only one of much importance is available. A business house having a long list of customers is likely, from the extreme volume of its ledger, to suffer delays in taking trial balances. It is common under those circumstances to put the names of all customers into a special ledger (or as many ledgers as are convenient) and to represent the whole body of customers by one account in the general ledger, commonly called "Accounts Receivable." Such a special ledger is usually called a "sales ledger." A similar device provides a "purchase ledger," and an "Accounts Payable" to represent it in the general ledger. The treatment of these books and these accounts in the general scheme is simple. In the first place, the total of the sales book at the end of the month, besides going to the ledger as a credit to Merchandise, is posted as a debit to Accounts Receivable. By this means, with no more labor than that of making one posting, the whole body of customers is represented in the general ledger. The amount to be debited to each individual customer is posted to that individual's account in the sales ledger just as previously it was posted to the general ledger. In the cash book, too, a special column is provided for Accounts Receivable, and whereas the credits to individuals on the payment of their bills is made in the sales ledger just as previously it was made in the general ledger, the total of the Accounts Receivable column is posted at the end of the month to the general ledger, representing the whole body of customers. It may be also desirable to provide a column in the journal for Accounts Receivable, so that when bills are paid by notes or in any other way than cash, the two postings, one to the individual in the sales ledger,

and one to Accounts Receivable in the general ledger, may be made without the confusion of requiring two postings from the same figure. The account called Accounts Receivable is not an absolute essential of the division of the ledger into parts, for without it the ledger would simply consist of two or more volumes. With such an account, however, the general ledger shows always, when posted to the time in question, just what sums are due the firm from customers — information which could not be obtained otherwise without figuring all the accounts in the sales ledger. This account, too, serves as a check or test for the correctness of the sales ledger, for the balance of the Accounts Receivable should always be the same as the balance of all the accounts on the sales ledger. Accounts of this sort are commonly called “controlling accounts.” To summarize: the accounts of all customers of the firm are kept in the general ledger in a *bunch*, as Accounts Receivable, and the amount of each customer’s share in the bunch debt is kept in the sales ledger only; similarly kept are Accounts Payable and the purchase ledger; posting the bunches as totals of columns prevents extra labor from the double posting.

This is shown in the following figures from a cash-book page:

		RECEIPTS <i>Dr.</i>	<i>Cr.</i>		
Jan. 1	√	Balance	2,354	Accts. Rec.	
13		Bills Rec'ble #67 Paid			2,700
47		B. Sykes Paid invoice, 12/1		600	00
64		B. Patterson To bal. acct.		400	00
17		Accts. Rec. Total		1,000	00
9		Cash, Dr. “	3,700		00
			6,054		3,700

[The credits to B. Sykes and B. Patterson are posted to the sales ledger, and the total, or credit for Accounts Receivable, to the general ledger.]

Since the general ledger only is included in the trial balance, the correspondence of debits and credits is not thrown out by the double posting.

Practically every type of abbreviation of record-writing in common use is represented in the illustrations given above. The variations of each type, however, are of course infinite in number; but the

principles remain the same. For those who care to pursue the subject further, some illustrations are given in Appendix A, I.

One comment on the whole system remains to be made. The modern passion for short-cuts must not be carried so far that the definiteness of the detailed portion of an entry, the day-book portion, shall be sacrificed. One illustration will suffice. Suppose a man buys, in settlement of an account, his debtor's half-interest in a piece of real estate, say worth \$5000, and takes cash for the balance of the debt, say \$2500. Suppose now the man buys from some one else the title to the remainder of that piece of real estate for \$5000, using in part the cash received from his debtor, which pays for one half what he buys, or one quarter of the whole property. He would be very foolish to record that he had received three fourths of that property from his debtor (though he did receive one half and cash enough to buy another quarter) and had bought the other one fourth from the other owner. Such abbreviation would save one entry, but it would falsify the record. If the deeds should be lost before they were recorded, and it were shown that the debtor never owned more than one half of the property in question, the buyer's books would militate against him in his claim to the whole property. They would indicate that he had bought from the last seller but one quarter of the property and had taken from his debtor what the debtor did not own. Transactions which are for any reason distinct must not be combined in a way that will destroy their identity.

Often, on the other hand, good bookkeepers make entries that are known to be false in detail, though not in essential facts, if they can make the detailed explanation sufficiently clear and can save labor in the process. A good illustration of this is in connection with Accounts Receivable. Often customers are allowed discounts if bills are paid within a certain number of days. The entry of a payment of this sort would naturally involve two transactions, recorded in two books, — on the cash book a credit for the customer and a debit to Cash for the net cash paid, and on the journal a credit for the customer and a debit to Merchandise Discount. These two entries in two books mean unnecessary labor. Several devices are in use for reducing it, and the principle is worthy of notice. The simplest will serve for illustration here. Credit is given

the customer for cash in the usual way, but the amount is given as the full amount of the bill before discount was subtracted, — as if the bill were paid without discount; and then on the other side of the cash book, Merchandise Discount is debited, — usually in a special column to save frequent postings. The net result of these two entries is to make it appear that the customer paid the full amount of the bill and the cashier returned to him the discount; and this is for practical purposes true enough, especially when the customary entries explain it, as they do. An overstatement of facts when the necessary subtraction is at hand does no harm: danger lies in the understatement for which deficiencies cannot be supplied. Other methods of accomplishing the same result are given in Appendix A, I.

All books of original entry should be so arranged that no items can be inserted after the books are written in natural order. Thus each cash-book entry should occupy but one line; for if some should occupy one line and others more, figures could be inserted on the lines where no figures originally appeared. For the same reason, no blank lines should be left between cash-book entries. On the journal, the sales book, and the purchase book, however, blank lines are not only safe but desirable; for in those each entry necessarily occupies more than one line, and a blank line, or a line used for the date only, shows separation between entries so that the eye can easily distinguish them, and yet does not allow space for a fraudulent insertion.

PART TWO

THE PRINCIPLES OF ACCOUNTING



## CHAPTER SEVEN

### THE DISTINCTION BETWEEN CAPITAL AND REVENUE

PERHAPS the easiest way of stating the difference between bookkeeping and accounting is to say that the purpose of bookkeeping is to show debts, both those due by the owner of a business and those due to him, and the purpose of accounting is to show profits, losses, and valuations. Nobody is likely to think that he now has what he never had, but a business man is constantly likely to confound what his business once had, but no longer has, with what it still has. The fundamental purpose of all accounting processes is to provide against such confusion; and just here, more than anywhere else, does the average business man fail to get from his books what he thinks he is getting. As a part of the same confusion, though the connection is not always obvious, is the ignorance of costs and returns. Good accounting will show as nearly as possible the cost and the return from every application of force and from every change of methods — in service, as in mercantile affairs, and in transportation, or in production, as in a factory.

In Chapter IV of Part I, two sorts of internal accounts were described, the real and the nominal, or, as they are sometimes called, property accounts and explanation accounts; and in Chapter V emphasis was laid on the fact that in determining profit for the year it is of vital importance to distinguish between these two sorts. This was shown by carrying out the six-column statement so that figures of the one sort were extended into the columns devoted to resource and liability, and those of the other into the columns devoted to loss and gain. These are mere bookkeeping expressions with which the average business man has little occasion to deal, but every man engaged in business affairs must, at some time or other, deal with these things whether he calls them by any name or not. For example, most corporations report their business under the head of two statements, the first of which is commonly called the "balance sheet,"

and the other the "income sheet," though each is sometimes called by other names. The balance sheet is simply a statement of resources and liabilities,<sup>1</sup> or property and claims (both favorable and unfavorable); and, consequently, it shows the solvency of the business. The income sheet, on the other hand, shows earnings and expenses for the year just passed, that is, the sources of gain and the kinds of cost or loss. The balance sheet accordingly represents the *real* accounts as they stand at the *end* of the year; and the income sheet shows the *explanation* of the changes in solvency, so far as profit and loss have produced them, *during* the year. The balance sheet gives a summary view of the situation at a definite moment of time: the income sheet gives a summary story of the last year that produced that situation. These two statements correspond exactly with the two sets of columns on the six-column statement into which the trial balance is extended. If, then, one desires to determine the solvency of a business, one must turn to the balance sheet; but there one gets no information as to earnings or expenses. If, on the other hand, one wishes to determine profits, one should turn to the income sheet; but there one can get no information as to ultimate solvency. There is, nevertheless, one common element between these two sheets; this is the figure of profit or loss still remaining in the business as an element of solvency. If, for example, the business has been accumulating a surplus of 10% a year for five years as shown by the last five income sheets, the last installment of it will appear on the income sheet accompanying this year's balance sheet, and will also be in-

<sup>1</sup> Some accountants favor making a distinction between a balance sheet and a statement of resources and liabilities. In their practice, a balance sheet would represent figures taken directly from the books without allowance for possible or theoretical shrinkage in values, whereas a statement of resources and liabilities would show results after such allowances had been made. No exception can be taken to such distinction, and it is indeed desirable that it shall be not only made but published in the form of the two tables. When but one of these two tables is published, however, it is desirable that the balance sheet, rather than the statement of resources and liabilities, shall be chosen. The advantage of this is sufficiently illustrated by the case of Bills Receivable, which must appear on a true balance sheet at the face value of all the notes, but must usually appear on a true statement of resources at a lower figure. The objection to a publication of the latter rather than of the former is that, since the valuation is determined by judgment, and since no two men may judge quite alike, the arbitrary valuation may not be so satisfactory as a piece of information for the intelligent reader as would be the face value of the notes themselves. This is further discussed in the next chapter.



cluded in the surplus, which appears upon the balance sheet as one of the liabilities of the corporation to its stockholders. We have this common element because the year's transactions as shown by the income sheet have resulted in the situation shown for one moment of time on the balance sheet.

Thus it is obvious that no confusion can be permitted between items which are to appear upon the balance sheet and those which are to appear upon the income sheet; for if such confusion is allowed, what was *once had* is confused with what is *now had*. Only the balance sheet represents the present condition, whereas the income sheet represents the transactions which produced that condition but ceased to have independence as soon as they were completed; for all tangible results can be measured in the tangible items of the balance sheet. In accounting parlance, entering transactions so that they shall appear upon the balance sheet is called "charging to capital," and entering them so that they shall appear upon the income sheet is called "charging to revenue." Perhaps this can best be illustrated by a few examples.

Suppose we are the owners of a building. It has been in use as a bowling alley, a skating rink, or a riding school, and the movement of business and population requires that in order to serve good tenants it shall be cut up into various stores. The building is remodeled, and the question arises as to what account shall bear the charge for remodeling. The exact title of the account is not here of importance, but whether it should be charged to revenue or to capital is a matter of the greatest importance. Let us assume, for the purpose of making our illustration clear, that the alternative is simply charging to Rent or to Real Estate.<sup>1</sup> The real estate account, representing property, should represent on the books the value of the building. The rent account, on the other hand, since it is nominal, should show the earnings from rental less any deductions that may be necessary to secure that rent. It is fairly obvious that under the conditions named the cost of these alterations should be charged to

<sup>1</sup> It is intended to use initial capitals for the names of ledger accounts, without using the word "account." The expression "real estate," therefore, means in the following pages the actual property; but the expression "Real Estate" means the ledger account of that name. When, for any reason, it happens to be desirable to use the word "account" in connection with a ledger account, capitals will not be used.

Real Estate and not to Rent, for the improvement is intended to be permanent. Now let us suppose that after one of these stores has been let for a year the tenant moves. Another man offers to hire the store if we will take out the windows and substitute others adapted to his particular business, and he refuses to hire unless we make the change. Suppose again we charge to Real Estate, on the ground that the property is improved. In the course of time this tenant moves; and, in order to let the building again, we are forced to replace the old windows. Here, clearly, the question might arise as to which account the alteration should be charged to; but let us suppose that on the principle that the alteration makes the building worth more for present purposes than before, the charge is made to Real Estate. Now, in course of time, business has left that section of the city. Small shops succeed large stores. We cut the old store into several small shops and charge to Real Estate. At the end of this year the tenants move out, and we can let the property again by removing the partitions. We make the change and, as before, debit Real Estate. So the thing, let us suppose, is repeated indefinitely. Each year we make some change and the next we undo what we had done. Each year we charge Real Estate for improvement in the property, making it each time rentable. What is the result? Our books show a steadily increasing charge to Real Estate, and yet the property is presumably even less valuable at the end of the time than at the beginning. Clearly this is bad accounting, and the fault lies in the fact that some of these alterations were not permanent improvements, but were mere costs of getting rent. They were expenses or loss, incurred in the process of earning rental. They should have been set against that rental and not considered as additions to our property. Though ordinarily it would be desirable to distinguish between deductions from rent and alterations to secure rent, for our purposes here we may disregard such distinction, since both are charges against revenue, and say that the charges for alterations, in most of these cases, should have been made to Rent. They were proper charges to revenue, and not to capital account. In other words, at the end of the year, they should have been extended on the six-column statement not into the resource column, but into the loss column. They should go not upon the balance sheet as resource, but upon the income sheet as expense. They should not be counted

as investment, or capital, but should be taken out of earnings, or revenue.

The last problem was concerned with determining to which of two accounts an item should be carried. Let us take another sort of case. Suppose you are engaged in the ice business and have on your ledger an account with a certain ice house, charging that ice house with the cost of ice put in. At the end of the year that ice, considered on hand ready for the next season's business, is a resource, and is naturally carried into the balance sheet under the title, we will say, of "Silver Pond Ice." Now suppose that in the spring, before the season has opened, a fire destroys the house, and, in consequence of the heat and the exposure, the ice is destroyed.<sup>1</sup> What entry need be made upon the books? Clearly no entry becomes necessary if, in closing the books at the end of the year, you realize that that Silver Pond Ice account is no longer a real account, but has become, by force of circumstances, nominal. It will then be carried on the six-column statement into the loss column, and, what is the same thing, will be carried into the income sheet as one of the losses rather than into the balance sheet as one of the resources. In other words, the same account may represent an item upon either sheet, and its ultimate destination will be determined by the particular thing it represents at the time the sheets are made out. On the books there is no difference in appearance between a revenue account and a capital account. It is only in interpreting the figures at the end of the period that any distinction need be made, and then the interpreter must know exactly what the account at that moment represents.

Let us take a third sort of case. You are the owner of a quarry, and preparatory to getting out rock it is necessary to remove "top," that is to say, get off the loose earth which covers the valuable stone. Suppose, for purposes of our illustration, that it is convenient to remove, before any excavation is begun, all the top from the bed of rock to be quarried. Suppose it is known that this particular bed of rock will last for four years. At the end of the first year how shall the cost of removing top appear upon the books? Clearly the removal of top is an expense and must go ultimately into the income sheet. It is a cost of obtaining revenue and therefore chargeable to revenue account. Yet three fourths of the cost is as yet unutilized and is con-

<sup>1</sup> This illustration is repeated from Part I, page 12.

sequently a resource for the future. At the end of the first year, therefore, three fourths of this cost may be counted as a resource, and may appear upon the balance sheet; whereas the remaining fourth, chargeable to the revenue of that year, must appear upon the income sheet. Suppose, now, to make our illustration a little more serviceable, the bed of rock is of a peculiar formation, so that in three of the four sections into which the bed may be divided there are known to be three hundred thousand tons of rock each, whereas in the other section there are known to be but one hundred thousand tons, and the section containing the one hundred thousand tons is that removed in the first year.

100,000 Tons	300,000 Tons	300,000 Tons	300,000 Tons
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At the end of the year how shall Top-removal stand on the books? Clearly, one fourth of it has been consumed in getting out but one tenth of the total amount of rock. Is it chargeable against one quarter of the rock or against one tenth? That is to say, shall we take for our basis of depreciation the total utilization of top-removal, or shall we take the amount of rock quarried by means of that utilization? Shall Top-removal be included in the balance sheet as-if the fraction still serviceable were three fourths or as if it were nine tenths? Still further information is necessary to enable us to determine this fraction. If in order to reach the rock in the three larger sections it were necessary to remove the top covering all four sections, the top-removal now utilized (that over the small section) would be a direct cost chargeable against the full one million tons; that is to say, only one tenth of its serviceability would have been consumed and nine tenths would remain. If, on the other hand, the top over the small section has nothing to do with quarrying in any other section, as is of course probable, one fourth of the top-removal has been utilized and only three fourths of the total cost can be considered an asset. So in one case the balance sheet will include nine tenths of cost of top-removal among the assets and the income sheet one tenth among the expenses, and in the other case the assets will include but three fourths and the expense will be one fourth. This difference is of more importance than may at first appear. One can-

not be sure, just because it will pay to remove the top over one of the larger sections, containing three hundred thousand tons of rock, that it also will pay to remove the top over the smaller section. It might indeed happen that the proceeds from the smaller section prove not enough to pay for the removal of top over that section. If that is the fact, the books should show it. Otherwise, the books are failing in one of the first purposes of all accounting, namely, to show not only what is the absolute profit or loss, but also the source from which each portion comes. Any failure to charge cost against the particular revenue for which it is incurred sacrifices information that may prove of great value.

It is obvious, from the three illustrations that have been given, that it is not always possible in making entries of cost or loss to treat them so that at the end of the year they shall be known at a glance to be exactly either revenue or capital. Allowance must usually be made. Nothing can be valued with permanent certainty. Even those things in business which seem most unchanging are subject to fluctuations, especially to depreciation. Even a stone building is worth less as the years go by; and, therefore, allowance must be made each year for some depreciation. It may seem that, if in the end so many allowances must be made, it is hardly worth while to attempt in the original entries to distinguish very exactly between revenue and capital. Some one may say if the allowances have got to be made at the end of the time, the original labor of distinguishing day by day may as well be saved. The answer is that the more carefully distinction is made day by day as original entries are made, the more largely is the labor of making allowances at the end of the year reduced to a minimum. The accounts should be so kept that they throw the greatest light possible upon the probable depreciation of each kind of property. It is obvious, however, that even with the most complete set of books at one's disposal, if one does not know what each ledger account represents one can tell nothing of how the business stands at any particular time. A cost account means a certain thing with one corporation, but may mean a different thing with another. One must know the business significance in each particular case. The presumption always is, however, that, unless something is known to the contrary, certain common accounts stand for certain definite things: that is to say, Rent, Interest, Wages, Commission, Insurance,

etc., are revenue accounts; and Real Estate, Bills Receivable, Accounts Receivable, and Merchandise are capital accounts.

Roughly, we may say that whatever is expected to exist as an asset at the end of the current earning period should be charged to capital, and whatever is expected to be consumed during the earning period should be charged to revenue.

Below will be found, from the reports of the United States Steel Corporation, a balance sheet for December 31, 1906, and an income sheet for the year ending December 31, 1906.

<i>Balance Sheet</i>			
Assets		Liabilities	
Property (Real estate, plant, etc.)	\$1,383,907,945.68	Capital stock	\$868,607,000.00
Mining royalties, etc., paid in advance	1,772,621.94	Funded and mortgage debt	566,388,375.96
Investments (outside real estate, etc.)	1,617,351.29	Current liabilities	43,672,009.34
Special funds	27,443,944.60	Special funds	104,921,669.74
Current assets (inventories, cash, claims, etc.)	266,567,905.88	Surplus	97,720,714.35
	<u>1,681,309,769.39</u>		<u>1,681,309,769.39</u>

<i>Income Sheet</i>		
Gross receipts from production		\$696,756,926.01
Producing costs, including maintenance	517,083,955.02	
Administrative and selling costs	18,551,552.75	<u>535,635,507.77</u>
Net receipts from operations		161,121,418.24
Other income		<u>9,159,863.74</u>
Gross income		170,281,281.98
Taxes	4,356,126.36	
Interest	29,401,328.68	<u>33,757,455.04</u>
Net income from operations		136,523,826.94
Less profits between departments, not yet realized by the combined business		<u>2,739,403.74</u>
		133,784,423.20
Appropriations for sinking funds, extraordinary depreciation allowance, etc.,		<u>35,655,836.26</u>
Available for dividends		98,128,586.94
Dividends		<u>35,385,727.00</u>
Surplus for the year <sup>1</sup>		62,742,859.94

<sup>1</sup> These figures vary considerably in some details from the figures of the report of the corporation; for, since our concern is with the distinction between capital and revenue, the distinction made by the company between the financial operations of the subsidiary companies and those of the central corporation is disregarded here. The figures above have come from combining the two statements which the report designates "Condensed general profit and loss account" and "Income account." The report also deducts from the surplus certain appropriations of \$50,000,000, and adds the accumulated surplus of past years. These do not properly belong on the income sheet, though they are conveniently read in connection with it.

It is to be noted that all items appearing on the balance sheet are either property (or claims) of the corporation or liabilities incurred by it in acquiring that property. The items on the income sheet, on the other hand, represent no property: they all once involved property, but that property has now ceased to be identified with income or costs, and is registered among the assets or the liabilities; the income sheet shows whence property came or whither it went. In very few cases, of course, do items on the income sheet represent accounts of the same name; for usually so many cost accounts are kept, for purposes of detailed study, that combinations must be used to show general conditions. Even condensed balance sheets, like that presented above, are usually made up of detailed accounts combined to show things in the large.

It is often convenient, in order to show the exact relative condition of all matters pertaining to income, to give separately three condensed statements, — supplements to the general income sheet. The first shows the elements of net principal income; the second shows the disposition of total income; the third shows the condition of the surplus. Briefly (and not necessarily completely) they might look as follows:

## ACCOUNTS

*Trading Account*

Merchandise Debit	\$55,000	Merchandise Credit	\$68,500
Rentals	1,000	Commission	3,500
Wages	5,000		
Advertising	1,500		
Miscellaneous expenses	1,000		
Balance (see below)	8,500		
	<u>\$72,000</u>		<u>\$72,000</u>

*Income Account*

Depreciation	\$300	Trading profits	\$8,500
Bad debts written off	100	Miscellaneous profits	300
Dividends	7,000		
Surplus for the year (see below)	1,400		
	<u>\$8,800</u>		<u>\$8,800</u>

*Surplus Account*

Loss by fire, not charged to the present year	\$2,000	Surplus Jan. 1, 1907	\$8,000
Balance	7,400	Surplus for the year	1,400
	<u>\$9,400</u>		<u>\$9,400</u>

The balance of surplus should agree with the surplus on the balance sheet, of course.



## CHAPTER EIGHT

### THE GENERAL PRINCIPLES OF DEPRECIATION

THE last illustration in the preceding chapter showed that in treating depreciation one is concerned not chiefly with a choice between different accounts when an entry is originally made, but with the length of time the value shall remain charged to capital account. Allowing for depreciation is usually called, in technical terms, "writing off." The expression means simply that the valuation formerly on the books is displaced by a new and smaller valuation. This expression is used whether the change is made by simply revaluing the original account by the method shown in Chapter V, page 47, or through a depreciation account, as shown in Appendix B, II.

The converse of "writing off" is "writing up." This expression means simply that the valuation set upon the property has been increased and is carried forward as a new valuation. It is hardly likely to be done through the medium of another account, unless one wishes to open an account called "Appreciation," and it is, therefore, managed simply by bringing down a new valuation, as shown in Chapter V.

We have already considered the principle of depreciation as shown in its simplest type, and we must now see some of the particular forms in which it may appear. The method of handling it will depend upon the circumstances under which it occurs. There are three main policies of treating depreciation, and one or more of these three is adapted to every conceivable case. The three policies are these: first, allowing the property to wear out or go to decay without replacement, on the theory that no use will ever again be had for its like; second, keeping the property up to the original standard by frequent repairs and replacements but without special provision for future replacements; third, allowing depreciation to continue to a certain point and accumulating, in the mean time, special funds to be available for replacement at whatever time it shall become

necessary. Let us see how these three forms will appear in accounting.

The first, allowing the property to wear out without provision for replacement, can be good business policy under only one condition, namely, if the business, or that department of it, is to be abandoned. In such a case policy requires full benefit to be got from the plant without large cost for renewal and repairs. The property must be exhausted as thoroughly as possible. An easy method of treating depreciation under such a condition would be to distribute to stockholders all net receipts. If that is done, stockholders get all they are entitled to, and when the business is exhausted the profits stop and the capital is gone. If the capital was originally wisely invested and has been properly employed, the stockholders will ultimately receive back their original investment in the final winding-up of affairs; for if the business could have replaced the worn-out plant — as it could if prosperous — it can pay the stockholders as much as replacement would have cost, which is, of course, practically the original capital.<sup>1</sup> The thing works automatically; but since, as a matter of fact, the stockholders are getting their capital handed back to them piecemeal, they must be informed that the dividend is not all profit, or they may be sadly deceived and led to consequent extravagance and ultimate loss. Careful accounting should show that a part of each dividend of this sort is not earnings, but is simply capital returned because the business has no further use for it. The method will be then as follows: first, debit Profit and Loss for the depreciation of property, and credit Real Estate and Plant. The loss, going upon the income sheet as one of the expenses, causes the net income to appear so much less than otherwise; and the credit to Real Estate and Plant reduces the resources on the balance sheet by the same amount. As soon as certain parts of the real estate and plant have worn out, since they have not been replaced or extensively repaired the property other than real estate and plant in the hands of the business is greater in amount or value than it

<sup>1</sup> Of course fluctuations may occur in costs between the time of original investment and the time of exhaustion, and in any particular case the capital may not be restored; but the price of commodities cannot ordinarily and permanently fall so low as to fail to supply replacement funds for goods manufactured under proper conditions; or else manufacturing would not pay.

would have been had replacement and repairs been made. To express the same thing in another way, instead of a certain value in buildings and machinery, the corporation has now certain goods, or cash, or claims. Ordinarily a certain part of the product is exchanged for repairs or replacement; but under these conditions, since no repairs or replacements have been made, the equivalent remains as free assets. What shall the corporation do with these assets? It may hand back its now unnecessary capital to the stockholders, — (1) by calling in stock, (2) by buying its own stock on the market, or (3) by accumulating a fund available for redeeming all its stock when the business is run out.

What, then, will the books show to the man familiar with accounts? First, a rapid depreciation of the value of real estate and plant; second (Plan I), a reduction in capital stock, or (Plan II) an increase of treasury stock, which amounts to the same thing, or (Plan III) the accumulation on the resource side of the balance sheet of a real fund, available to pay for the capital stock when finally called in. These items must show also on the income sheet; for the depreciation will appear as a cost or loss.

This may be illustrated by bits from balance sheets and income sheets as follows:

		<i>Balance Sheets</i>	
Assets			Liabilities
		First year — All plans	
Plant	90,000	Capital Stock	100,000
		Second year — Plan I	
Plant	80,000	Capital Stock	90,000
		Second year — Plan II	
Plant	80,000	Capital Stock	100,000
Treasury Stock	10,000		
		Second year — Plan III	
Plant	80,000	Capital Stock	100,000
Retirement Fund	10,000		
 <i>Income Sheet</i> 			
All plans			
Depreciation (included in operating expenses, or, better, given separately as an element in such expenses)			10,000

Now we are ready for our second sort of policy in the treatment of depreciation. In this, replacements and repairs are made as they may become necessary to maintain the original standard, and no effort is made to provide funds for future replacements or repairs. This is the common policy of railroads. Railroad property comprises so many parts — depreciating at so many varying rates, and most of the parts, such as cars, rails, ties, bridges, etc., lending themselves readily to exact repairs or complete replacement — that the necessary repairs or replacements in any one year are likely to measure fairly well the average rate for all years. It is obvious that under such circumstances, with intelligent and careful daily bookkeeping, depreciation to great extent takes care of itself. The property ought to be in as good condition at the end of the year as at the beginning; and, if it is so, a debit to revenue of the cost of repairs and replacements is all that is necessary to make the books tell the truth. Obviously this treatment of depreciation cannot appear on the balance sheet. The balance sheet does not represent the transactions of the year except as those transactions produce results that last into the new year and affect resources and liabilities. Repairs and replacements, since they have simply maintained the old status, cannot show on the balance sheet. On the income sheet, however, they must be included among the costs or expenses of conducting the business.

Under the third policy of treating depreciation, repairs are presumed to be unable to maintain the property at its original standard. For example, many buildings used for manufacturing purposes depreciate rapidly under the influence of steam, jar, and chemicals, and cannot be maintained by economical repairs. A manufacturing corporation having such buildings, since it cannot keep them renewed by ordinary or even extraordinary repairs, must naturally replace them. It may chance that two buildings may need to be replaced in one year and that for five following years no other may need attention. Clearly, that one year should not suffer a charge to revenue of the cost of the two new buildings and leave five years to escape without any such loss. Bookkeeping of that sort would be almost as deceptive as would charging the new buildings to Real Estate. There was as much depreciation in each of the six years as in the one. The proper method is to charge depreciation each year

with a fair proportion of the wear and tear that is not offset by repairs, and to lay aside or retain in the business from each year's income an equivalent sum as a depreciation fund. This fund must be available whenever replacement becomes necessary. This policy should show, or at least have effect, upon both the income sheet and the balance sheet. The depreciation would appear on the income sheet as among the losses or expenses. On the balance sheet, it may appear in either of two ways, or not at all. If (Plan I) the fund is set aside in property, Real Estate and Plant would have been written off, and among the other resources would appear an item of Depreciation Fund for the amount of money set aside. If, on the other hand (Plan II), the fund is not set apart but is left in the business — that is, simply subtracted from the figure of apparent profits and hence not distributed as dividends — it is scattered among the assets and cannot be identified as a distinct fund. Sometimes in such a case, the former valuation of the depreciated property is maintained, and to offset this exaggeration an item "Depreciation" appears on the liabilities side of the sheet, representing the liability of the business to the stockholders for property consumed and not yet replaced. The true situation can then be seen only if one notices that this item serves no other function than to measure the excessive valuation of the Real Estate and Plant. This method therefore cannot be defended: under it, especially if the credit item is called "Depreciation Fund," only after a study of figures not commonly reported can one tell whether the depreciation fund measures depreciation actually suffered and not yet offset, or is a special reserve fund set aside from net profits in anticipation of possible depreciation not yet known to have been in force. No figure that is meaningless or deceptive except when read in connection with some other detached figure should be published in any form. When at the end of any year it is known that depreciation has been suffered, the valuation of the property should be clearly written off. If, finally (Plan III), no depreciation fund is set aside, either in specific property or in general assets out of surplus earnings, — *i. e.*, the provision for replacement lies scattered among the assets and the Real Estate and Plant is written off, — no item of Depreciation Fund should appear on the balance sheet — for no such fund exists. The assets are (as in Plan I) simply maintained at their

original amount, though in a different form, — general assets instead of Real Estate and Plant or a fund.

This treatment of depreciation will appear under the various plans as follows:

<i>Balance Sheets</i>		Assets	Liabilities
First year — All plans			
Plant		90,000	
Second year — Plan I			
Plant		80,000	
Depreciation Fund		10,000	
Second year — Plan II (objectionable)			
Plant		90,000	Depreciation
[Miscellaneous assets increased]		10,000	10,000
Second year — Plan III			
Plant		80,000	
[Miscellaneous assets increased]		10,000	
<i>Income Sheet</i>			
All plans			
Depreciation (included in operating expenses, or, better, given separately as an element in such expenses)			10,000

## CHAPTER NINE

### THE GENERAL CHARACTERISTICS AND THE INTERPRETATION OF BALANCE SHEETS

PERHAPS the best way to apply the truths discussed in the last two chapters is to take an imaginary balance sheet and see what criticism can be applied to it. As a preliminary to this, however, it is desirable to examine in detail some general facts about the most common items appearing on balance sheets. We will use, for a basis, a comparison of imaginary balance sheets for three years. (See page 86.)

It was suggested in Chapter VII that the name by which an account is called is of far less importance than its disposition in closing the books for the year, — that is, determining whether its amount shall go into the income sheet or into the balance sheet, shall be charged to capital or to revenue. This suggests the necessity of getting behind the returns in any corporation statement. The first items on a manufacturing balance sheet are usually Real Estate and Plant. Though ordinarily they should be separated, they may here be considered together. The obvious questions in connection with them are, first, what is the basis of the valuation, and, secondly, what is the allowance for depreciation. Of the valuation usually no judgment can be formed unless one can examine the property itself. On the second question, however, means can often be found for forming some judgment. The figures of the balance sheets given below indicate that in the year 1907 \$20,000 was allowed for depreciation and was set aside as a special fund for repairs or replacement; for, on comparing the sheets for the two years, we see that the Real Estate and Plant items have been written off to the amount of \$20,000, and that a depreciation fund is among the assets. This depreciation fund must be a real thing, for it could not appear among the assets under the name of a fund under any other conditions — unless, indeed, the books lie. All the resource accounts except a possible profit and loss deficit, which is a resource only as it explains or satisfies the stockholders as to what has become of their property,

## ACCOUNTS

*Comparative Balance Sheets, Dec. 31.*

	1905	1906	1907	Liabilities	1905	1906	1907
Assets				Capital Stock	500,000	500,000	600,000
Real Estate and Plant	275,000	420,000	400,000	Bills Payable	100,000	100,000	10,000
Bills Receivable	8,000	60,000	55,000	Accounts Payable	20,000	20,000	20,000
Accounts Receivable	2,000	10,000	5,000	Reserve			
Supplies	15,000	5,000	5,000	Profit and Loss			
Cash	300,000	40,000	20,000				
Merchandise		105,000	125,000				
Depreciation Fund			20,000				
Reserve Fund			20,000				
	600,000	640,000	650,000		600,000	640,000	650,000



must be real accounts. Hence Depreciation Fund must represent property — cash, or bonds, or something of that sort — set aside to replace the worn-out buildings or plant. The balance sheet ought to state what the property is, and if it does not do so it is by so much deficient.

Has it cost the corporation anything to accumulate this fund? If our real estate and plant are wearing out and are profitably employed, it is obvious that they are reproducing themselves in the annual product. It follows, therefore, that, if the corporation cannot take from the annual product and lay aside as a depreciation fund the equivalent of the annual wear and tear of the real estate and plant, it is running down hill. In other words, that depreciation fund was created, day by day, in the regular product of the business. Real estate and plant, by constant use, have been slowly converting themselves from buildings and machinery into merchandise. It is the business of the accountant to see that that conversion is recognized and recorded. The surest way to keep it clearly in mind is to take the proceeds from the sale of some of that merchandise and set it aside as a special depreciation fund. Such a depreciation of real estate and plant is loss, of course; but it is loss only in the sense that the consumption of raw material is loss; it reappears in the form of goods, and a certain part of the product must be recognized even in that form as converted depreciation.

This item of Depreciation Fund might under some circumstances properly appear also on the credit or liability side of the balance sheet. It will then represent liability of the business to the stockholders, for depreciation cannot affect outsiders. The liability of the business to stockholders for original subscriptions to capital stock is already recorded in the capital stock account, and the only other items for which the business can become responsible to stockholders are loans and profits earned. This is clearly not a case of loan, and therefore must register profits. In other words, the appearance of the depreciation fund on the credit side of the balance sheet means properly that there has been set aside from receipts not only enough to offset the actual depreciation of the property, so that the original value has been maintained, but that certain net profits which have been earned by the business have been set aside to constitute a fund for extraordinary depreciation not yet known to have

been incurred but provided against for safety. To express the same thing in another way, all the resources of the business must offset all the liabilities, — which include both the liabilities to outsiders and the liabilities to stockholders. The liabilities to stockholders are of two sorts, — the original subscription, and accumulated profits. If there had been no accumulated profits, the resources on the balance sheet would exactly offset the liabilities including the subscription for capital stock. The only way the resources can rise to a larger sum than these liabilities is by the accumulation of profit, under whatever name that profit may appear. Consequently this depreciation item on the liabilities side shows that the sum must have been set aside from net profits, and therefore is thought to be in excess of the actual depreciation of real estate and plant, — for actual depreciation must be provided for as an element of cost before net profits are determined. In other words, this depreciation fund is a sort of insurance against depreciation not probable but possibly to be discovered in the future.<sup>1</sup>

Would it be possible for the depreciation fund to appear upon the credit side of the balance sheet and not upon the debit side? Under usual conditions, as shown in the preceding case, a depreciation fund on the credit side of the sheet has been accumulated out of profits. If no fund appears among the assets, the question arises whether the depreciation fund is a real thing. The fact that the balance sheet shows a correspondence of debits and credits indicates

<sup>1</sup> This case illustrates the objection to a method of treating depreciation described in the preceding chapter (page 83). Since, as here, a credit item of this sort should express surplus earnings, to use it as a means of performing a subtraction from resources (as in the previous case), which is in some points of view the exact opposite, violates all good form and unless specially explained is a practical lie. To avoid confusion of this sort, it would be well to distinguish clearly by name between different phases of the same general item. For example, a credit item representing shrinkage of assets, if used at all, should be called not "Depreciation Fund," but "Depreciation." A credit item representing the surplus profits should be called "Depreciation Fund." A debit item representing the property in such a fund should be given a name that would suggest its significance, as "Depreciation Fund Bonds," or perhaps merely "Depreciation Fund Assets." A confusion of names might lead to a consolidation of items and, by offsetting debits with credits, cause one or another to disappear. Theoretically, since the liability for a fund is discharged by the assets of the fund, one might disappear; but so long as the fund has an existence the exact status of both sides should show.

that for all the liabilities there exist somewhere resources of the same amount. If accumulated profits have been set aside under the name of Depreciation Fund and appear as liabilities, clearly the same amount must be somewhere among those resources. Where is it? No one can tell where it is, but it must be there; and the conclusion is that, instead of being set aside as distinct property, such as bonds, or cash, it is distributed among the general assets because the corporation believes that it can use the money more profitably in its own business than by investing it in any particular fund. The only question as to the wisdom of this policy is the question of the availability of the fund, that is, whether in case of need the property could be quickly converted into cash so as to be put to its intended use.

To summarize what has been said of the depreciation fund, then, we find that it may appear on the balance sheet in one of three combinations: (1) among assets only, — in which case specific property is set aside to replace or repair machinery, or buildings, or what not, that are thought to have suffered actual depreciation; (2) among both assets and liabilities, — in which case specific property is set aside from net income as a safety fund for possible depreciation not thought to be actual; (3) among liabilities only, — in which case the amount is deducted from net income and shown on the books as a safety fund for replacement purposes, but the actual property is left among the general assets without specific designation. In the first case the fund could not be distributed to stockholders without impairing capital; in the other two cases the policy might be changed and the fund distributed without affecting capital, though such distribution might be morally or legally unjustifiable as a violation of implied faith.

The principles shown here as applying to a depreciation fund are applicable equally to other funds, — such as reserve funds, insurance funds, retirement funds, etc.

The next item on our balance sheet is Bills Receivable. About the amount of this item there should be no question, for notes should always be entered at face value; but about the real value, that is, the amount that can be collected, there may be much question. Hence the item appearing upon the balance sheet is comparatively of little significance to an outsider unless he learns the names of the

makers of the notes with the amounts signed by each. In that case mercantile agency reports can furnish the basis for the estimate of value. An assistance in estimating the value of these notes is a statement of how many are renewals, that is, how many represent payments deferred beyond the time originally agreed upon for payment; for presumably a man who cannot pay at the time agreed upon is in financial straits. One thing is sure, unless the bills receivable are unusually good some of them are likely in the long run to prove uncollectible and some provision should be made for loss. That provision can hardly be made by revaluing the bills receivable, for bringing down a new valuation would throw Bills Receivable out of correspondence with the amount of notes on hand. The doubt cast upon the bills receivable is really doubt cast upon the profit and loss account, or Surplus, or Undivided Profits. The reason for this is obvious, since, as we saw some time ago, the profit and loss account on the balance sheet represents simply excess of resources over liabilities. Any doubt cast on the value of those resources is by the same token doubt cast on the profit and loss balance. Since, too, losses due to the failure of customers to pay their notes will be debited ultimately to Profit and Loss, the profit and loss account represents accumulated profits figured on the supposition that all notes are good, and is a sort of insurance fund out of which to meet such losses. In other words, there should always be some sort of accumulation of past profits kept in the business to meet just such natural shrinkage of resources. How large a percentage of Bills Receivable can be safely counted good will depend on several circumstances. Of course, the notes held by a conservative house are likely to prove better than those held by one of mushroom tendencies. The percentage will vary in different lines of business. Indeed, it may differ as much as 30% between different industries. This is all we can say in general terms of the Bills Receivable on the balance sheet. It is perfectly proper for a man who has been invited to invest in a corporation or to lend to it to ask to see its bills receivable. How large a proportion should be considered good is a matter for judgment, and a man may properly demand a good basis upon which to exercise his own judgment and refuse, without implied discourtesy, to accept any other man's.

Our next item, Accounts Receivable, is so nearly allied to Bills

Receivable that practically the same things may be said of it. How many will prove good will depend upon conditions, and on what basis the item should be valued is a matter for individual judgment. A considerable difference in the amount and value of Accounts Receivable is likely to be found in different seasons of the year and in different trades. In some trades the holdings are lightest at about the time of the new year; in others, that is the time of the heaviest holdings. In some lines of business, book accounts (accounts receivable are called book accounts because the evidence of debt lies in the books and not in a note or other document) will average 60% uncollectible, and in others 80% on the average will be collectible.

Two differences between Bills Receivable and Accounts Receivable may be in some conditions important. A bill receivable is sometimes endorsed by a third party, who thereby guarantees payment if the first party fail. Such bills receivable are better than accounts receivable to the extent of the better security. Again, a note is evidence that the debtor has recognized the debt and its amount, whereas a book account may be disputed. It would generally appear, therefore, that when one is judging the solvency of a business, bills receivable are preferable to accounts receivable. There is, nevertheless, one advantage in an account receivable over a bill receivable, and that, under some conditions, may be worth recognition. The man who has paid his debt by means of a note is relieved of his responsibility for the original debt, and stands liable merely for payment on the note. The goods for which he incurred the debt cannot therefore be reclaimed by the seller, except as any property of his may be seized for debt. If, on the other hand, he has not given a note, his liability stands on the books in relation to specific property, and this, under some legal conditions, the seller may claim.

Of the supplies, the balance sheet, or the text accompanying it, should show the basis for the valuation. Normally, supplies may be figured at cost, for presumably they are to be worked up into other forms, — and this in fact is what they were bought for. The more nearly they are in the shape of raw material, rather than of partly manufactured material, the more likely they are to prove of full value; for styles and fads seldom affect raw material so as to render it unserviceable, though they very seriously affect goods that have gone through even slight manufacturing processes. Of course, if

supplies are inventoried at cost, care must be taken that only net cost is included, — that is, that all discounts have been subtracted whether those discounts were actually received or not. This matter of discounts in relation to inventories is of considerable importance. It will be discussed in detail in Chapter XXI, page 270. It is sufficient for our purpose here to note the outcome of it all. If business managers were to inventory supplies at cost to them, irrespective of discounts that they took or might have taken, the concern with the best means and best management would invariably show the lowest inventory for the same supplies; for such a concern, taking all discounts offered, would inventory at the lowest price, and a concern with scant means and poor management would neglect discounts and would inventory at the maximum billed price: hence the absurdity that the poorer concern would make the better showing. The escape is to inventory all items of this sort at the minimum price.

The next item on our balance sheet is Cash. It seems as if this requires no comment, and yet many attempts have been made to juggle with it. For instance, sometimes the item reads "cash and cash items." "Cash items" may mean anything under the sun. It may mean a slip of paper in the cash drawer, containing a memorandum that \$10,000 has been paid out on a bond, or that 50 ¢ has been paid for car fare; or it may mean that there has been deposited in the cash drawer a note on which the money may be collected some time. In a conspicuous case made public a number of years ago, these cash items included more than half a million dollars of worthless claims maintained simply to pad the assets. Any one invited to invest in a corporation should demand a full explanation of any such items. Some corporations avoid the possibility of misunderstanding by stating exactly where their cash is to be found, naming the amount on deposit with different banks and trust companies, etc., and stating the amount actually in the company's own vaults. This is proper reporting.

Next we have Merchandise. A few fundamental principles are worth attention. First, every increase in the valuation set upon merchandise at the end of this year means a smaller figure of profit next year. The figure of merchandise profit is determined by adding merchandise inventory to merchandise credits, and subtracting the

merchandise debits. That is to say, the sales, plus the merchandise unsold, less the cost of that which was purchased, must show the gain. If, now, the inventory is at a high figure, the net profit is shown as so much greater; but since in closing the books the inventory is brought down as a first charge to the new year, the new year begins with an excessive debit by the amount of exaggerated value for the goods included in the inventory. At the end of that second year, therefore, the merchandise debits are larger than they would otherwise be; and consequently the excess of credits is smaller than it would otherwise be; in other words, the profit has been anticipated, — and that, too, regardless of the costs of selling. Second, only the lowest net figures of cost, after all discounts have been subtracted, should be used. The reason for this is explained in connection with supplies above. Third, very few stocks of merchandise are worth what they cost. There is usually some loss in mere handling, — breakage and shop wear. There is decided loss in many lines of business from change of fashion. Some estimates, made by experienced appraisers, of the average value of stock in trade in different lines of business give for some trades but 50% of cost, and for others as high as 95%. Groceries, for instance, are generally standard articles and do not commonly depreciate rapidly. Dry goods and millinery are much subject to change of fashion, although even in the dry-goods trade some kinds of fabrics are much subject to change and others very little; figured silks, for instance, may soon prove unsalable, but cotton sheeting practically never. Again, a business must necessarily always carry a certain amount of dead stock. The stock was bought to satisfy all classes of customers and the actual proportionate demand of each class no one can ever exactly predict. Intelligent customers go where they are practically sure to find what they want, rather than to the store which is usually “out just now.” A good stock of goods must always supply more variety than the public wants, rather than less, merely to be on the safe side; and that excess serves as a sort of advertising to draw or keep custom. This cost is a part of the cost of running the business and must be charged ultimately to loss. A distinction must be made, however between a valuation made for purposes of closing a business and one made for a business as a going concern. A firm must have an excess stock of goods as just noted, and hence a valuation for

the business as a going concern may adjudge such stock to be worth nearly cost; but an appraisal for purposes of closing the business entirely, since such goods are from the nature of the case not in common demand, must put them at a very low figure.

We may now turn to the liability side of the balance sheet. Of Capital Stock there is little to say. Usually the figure represents the face value of stock outstanding. Sometimes instead of this it reports the face value of all stock authorized, even though some of it has not been issued. In such a case the facts will be sufficiently explained by an item on the resource side of the balance sheet called "Treasury Stock." That is to say, the corporation treats all stock as if it were issued, and counts as property its own stock in its treasury, just as it would count any other stock that it might own. This is unobjectionable, of course, if clearly shown.

Concerning Bills Payable and Accounts Payable little remark is necessary. They are debts of the business not subject to shrinkage. One item closely connected with Bills Payable, but not usually shown, is often of great importance. Not only are notes sometimes endorsed for others, but commonly bills receivable are discounted and when discounted must be endorsed. If any of the notes discounted by the business prove worthless, they must be redeemed. Loss on worthless notes cannot be shifted to some one else by the mere fact of discount. On all discounted paper outstanding, therefore, a concern has a contingent liability. Of course, this element of doubt applies only to bills receivable discounted and not yet due, not at all to those discounted and since paid. A method of estimating the element of doubt is obvious. Since all notes discounted have been recorded with the date at which they were to become due, the amount not yet paid is easily figured. It is safe to assume, in the absence of definite information to the contrary, that all endorsed notes payable at a past date were paid by the makers when due and therefore that the liability of the endorsers has ceased; for the law of endorsement requires the holder of a note to notify the endorser at once in case the maker fails to pay, else he loses all claim against the endorser. This notice is commonly called "protesting a note," and can be given only through a public official, such as a notary public. This sort of contingent liability need be figured, then, only on endorsed notes not yet matured and on protested endorsed notes, if any. The

*authorized - warrant*



amount of allowance to make for such notes would naturally be the same percentage used in considering the value of bills receivable on the resource side of the balance sheet, — unless, as may have happened, the firm in choosing what notes to discount has selected those better than the average. This contingent liability for endorsed notes obviously cannot appear on the balance sheet, for it does not appear as a liability on the books. It can appear only in a supplementary statement or appended note. In such statements the amount of contingent liabilities for endorsed notes should be mentioned, and it probably would be a satisfaction to stockholders to know what percentage of endorsed notes have had to be redeemed during the year just passed.

Somewhat akin to this contingent liability is another on account of contracts and merchandise for future delivery. A contract signed in December for raw material to be delivered and paid for in February constitutes one of the liabilities of the business on January 1. It cannot, of course, appear upon the books, and hence cannot appear in the main body of the balance sheet. It should appear in a supplementary statement or appended note so as to enable the stockholder to judge of the future needs of the business.

Reserve, or Reserve Fund, has already been interpreted, in connection with Real Estate and Plant, on page 89.

Profit and Loss, as shown here, is a pure nominal account, measuring the excess of resources over specific recognized liabilities. As explained in Chapter V, page 50, this figure of Profit and Loss is derived directly from the books, but, except for the lack of methods of proof, it could as well be got by subtracting resources from the other liabilities. It may appear under any one or more of several other names, — Loss and Gain, Surplus, Undivided Profits. Obviously here the \$20,000 of the reserve fund is one portion of it already subtracted and set aside. Commonly a reserve fund is for a specific purpose, though not always; a surplus is usually intended to be permanent; undivided profits are usually small remainders hardly worth including in the dividends; the items represented by Loss and Gain, and Profit and Loss, are not usually assigned to any specific use or plan. When no other item of this sort appears, as Reserve Fund, or Surplus, it is evident that Profit and Loss represents the accumulated profits, not distributed as dividends, of all the years.

A debit balance for this item, of course, signifies a deficit, or accumulated loss.

So far, expense and loss have been mentioned only in connection with some particular year's business, — that is, as if they could go only into the loss column of the six-column statement and into the income sheet. It is possible, however, to take the loss out of the earnings of no particular year. If the loss has been inevitable and general, touching the business as a permanent institution and not simply as a momentary thing, the charge may well be made to some account representing accumulated profits of the past. That is, the charge would be made not to some account that is closed out at the end of the year to Loss and Gain, and thus extended into the income sheet, but directly to the general profit and loss account or other undivided profits account that never appears on the income sheet; thus it would not appear anywhere in the expenses of the particular year in which it occurs. Illustrations of proper cases for such treatment would be the cost of repairs after an earthquake, and rebuilding after an extensive conflagration such that insurance companies were not able to meet their liabilities. A word of explanation of such charges should be given in the annual report, however, possibly in the form of a supplementary statement or appended note, for they cannot appear upon the income sheet proper. Sometimes in a report a separate statement is given of all changes in the profit and loss or surplus, as illustrated at the end of Chapter VII.

A good deal of tricky business has been kept out of sight, even when detailed balance sheets have been published, under the guise of branch assets and liabilities. The possibilities of confusion between the main house and the branch are numerous, and only watchfulness will prevent even innocent confusion. The only possible assurance of correct accounting in such a case lies in either absolute separation or absolute consolidation of the accounts, and even the latter is more or less dangerous, as may be seen by realizing that the bills payable of one may be the bills receivable of the other. For example, it would be easy to count a debt of the branch as a resource to the main house, but not count it as a liability of the branch for the plausible reason that it is not an outside liability. Again, the main house may count as a resource the notes of the branch payable to the main house for merchandise, and also count as a resource of

the main house such merchandise in the warehouse of the branch. A little sophistry of this sort enables a manager to count favorable things twice and unfavorable things perhaps not at all. Again, the relation of parent and branch may enable the parent to show a good profit at the expense of the branch. For example, the main house may sell goods to the branch at such prices that it makes a big profit for itself, but leaves the branch with a deficit. If, then, the affairs of the branch are not published, the existence of the deficit is hidden under apparent prosperity, and, although the condition must disclose itself in time, years may pass before the deceit is discovered. This sort of thing may be done not only to show a good profit on goods sold, but also to rid the main house of unsalable goods. Goods proving unsalable may be shipped to the branch and recorded as stock on hand, while even an expert investigation of goods in the main store may lead to a report that all goods are salable. Unless the investigation is extended to the branch, the ruse is likely to be successful. These misrepresentations of facts as between a parent house and its branch could never occur under correct accounting. Detection is simple if both sets of books and both sets of assets are examined and properly compared.

Let us now take the balance sheets given on page 86, with the assumption that we can get no further information about the business — having not even the income sheet, — and let us see what we can learn concerning the transactions of the years intervening between the three reports.

^ The first requirement of interpretation is a realization that nothing is either increased or decreased without an equivalent, — at least in double-entry accounting, and that is our only concern at present.

It is evident, in the first place, that an increase in a resource account indicates that something has been spent to acquire that increased resource. Similarly, a decrease in a liability account indicates the same sort of thing, for the liability must have been paid off, and therefore something has been spent. Conversely, a decrease in a resource account indicates that something has been taken from this account during the year and spent elsewhere; or, what amounts to the same thing, this decrease is part of an exchange of one asset for another. Similarly, again, an increase in a liability account indicates that the firm has borrowed some sort of property and hence it by so

much has had means to spend. By making a comparison, then, of these three balance sheets, tabulating the increases and decreases of resources and liabilities, we can see from what sources all receipts came and to what destination all expenditures went. In making this tabulation, we may well give any one of three titles to each column. Let us call the first column credits, or receipts, or "where got"; the second column we may call debits, or expenditures, or "where gone." Clearly, if any account on either side of the balance sheets remains at the same figure in any year as in the preceding year, however many transactions may have taken place in that account we need take no thought of them, for the net result was to leave the account as before; so we are concerned only with changes.

We will take one year at a time. Turning to the first account on the balance sheet, Real Estate and Plant, we find that between 1905 and 1906 it increased \$145,000. This increase in the resources shows where something has gone, and therefore it may go into the second column of our tabulation (page 101), sufficiently indicated by the words "Real Estate and Plant, +145,000." The next account, Bills Receivable, shows an increase of \$52,000. This also shows where something has gone, because if that item has increased by \$52,000 the firm must have acquired this claim by some means, and the increase indicates that property has gone in that direction to that amount. We tabulate it in the second column. Accounts Receivable is similar. The next, Supplies, has shrunk \$10,000. This means that \$10,000 worth of supplies has been taken from the storehouse and put to some use. In other words, the firm has got \$10,000 from that source. Hence the item is written in the first column of our tabulation as "Supplies, -10,000." The next item is a cash shrinkage of \$260,000. This means that there was at the beginning of the year in the bank or in the office \$300,000, of which \$260,000 has been taken out; and, therefore, this account has furnished to the business this amount of money, which may now be represented in the column headed "where got," as "Cash, -260,000." Merchandise has jumped from nothing to \$105,000. In other words, the firm has just begun business and has acquired in the course of a year by manufacturing, or purchase, or borrowing, \$105,000 worth of merchandise that must be accounted for. We know only that this amount of \$105,000 indicates how some resources have been spent,

and therefore the amount should appear in the second column as "Merchandise, + 105,000."

On the credit side of the balance sheet the first change is an increase in Accounts Payable to the amount of \$20,000. This can mean only that the firm had among its book debts at the end of the year \$20,000 which it did not have at the beginning of the year; and this borrowing, has enabled it to acquire certain assets. Therefore this increase should be entered in the first column among the receipts as "Accounts Payable, + 20,000." The only other change in this year is Profit and Loss, \$20,000. This means that the business has earned \$20,000 more than it has distributed in profits (whether anything has been distributed in profits we cannot tell from the balance sheet). This \$20,000 has been earned by the business. In what form, we do not know; but, in any case, it has furnished a resource by which the business has acquired some property. Therefore, it should appear in the first column under receipts, as "Profit and Loss, + 20,000." It is obvious that since the balance sheet for 1905 has a correspondence of total debits with total credits and the same thing is true for the balance sheet for 1906, the differences in accounts between the balance sheets of those two years must also show an equality of debits and credits. If we now compare these totals as arranged in the columns we shall find \$310,000 on each side, and our examination has proved.

We may profitably carry this examination one step further, to the year 1907. Before doing so, however, a few words more of explanation may be worth while.

Some of the items discussed above may have seemed contradictory. It should be noted that the figures we are using do not in themselves tell us anything of the transactions for the year that has gone, — they tell only what is the present condition of each account. An increase in present resources goes down in our table not among the resources but among the expenditures, — that is to say, if the thing mentioned as a change is now *on hand*, it was *not used* as a resource during the *year gone*, but was the cause of an *expenditure* for its *acquisition*. What we are tabulating is not the *things* got and the *things* spent, but the *sources* and the *destinations* of the getting and the spending. In our table, the expression "Accounts Payable, + 20,000," under "Where got," means not that accounts payable

were got, but that this item explains *whence* some of the things in the other column were got. The columns might have been named "What given" and "What got" — the former being equivalent to "Where got"; but that plan would have been confusing, for since profit and loss and the reserve fund came from earnings, nothing appearing on the balance sheet was given in exchange: they can be listed under "Where got," but they could not be listed under "What given."

For the second year, the first item, Real Estate and Plant, shows a shrinkage of \$20,000. This, standing alone, may be due to either a sale of property or allowance for depreciation. That is to say, either the property has been exchanged for other resources or it has been partly worn out producing something in its place. We enter it in the column "Where got." The next account, Bills Receivable, and the next, Accounts Receivable, show each a shrinkage of \$5000. Since each is a resource that has shrunk, it has *given up* some property that the last year turned to its own usage; and the amounts are entered among the receipts for the year gone. Cash, which has shrunk \$20,000, is in the same class. Merchandise has increased \$20,000, and that increase explains whither other resources have gone; and accordingly the item is tabulated among the expenditures. Depreciation Fund appears as a new item to the amount of \$20,000, and since it is on the resource side of the sheet it must indicate a real fund; this fund must have cost something, and since it shows where some property has gone, it must be entered as an expenditure. The same thing is true of Reserve Fund on this side of the sheet. Capital Stock has increased \$100,000. This is clearly a receipt for the year past, for the issue of this additional \$100,000 in stock must have brought some return, either additional resources or the cancellation of liability, — perhaps liability for debt or perhaps liability for earnings. Bills Payable has disappeared to the amount of \$100,000, and therefore something must have been expended to close that account; hence the item appears among the expenditures. Similarly, the reduction of Accounts Payable explains expenditures to the amount of \$10,000. Reserve Fund, appearing this time on the credit side of the sheet, explains that profits to the amount of \$20,000 have been set aside, and since these profits have furnished resources for the business they are entered among the receipts. Taking our totals of these



been distributed as dividends cannot possibly affect a balance sheet; they appear on the income sheet only. The only indication that the balance sheet can give is of the earnings undistributed, as shown in Profit and Loss or some similar account.

Such a table as that which we have been constructing was practically unknown in published reports until about five years ago; each year since that time one or more railroads have added something of this sort to their exhibits, usually under such a title as "Summary of Financial Transactions for the Year."

It is obvious that an important result of constructing such a table as that given above is the possibility of seeing from it at a glance the changes in solvency. Certain kinds of assets are always good, certain kinds are sometimes bad, and a few kinds are usually bad. Certain kinds of liability are not suspicious, and certain other kinds are often so. A summary table showing the changes, as above, indicates whether good assets are exchanged for less good, and whether troublesome liabilities are exchanged for those that are less exacting. For example, an exchange of cash for accounts receivable, dollar for dollar, is a sure sign of loss (supposing all other items to be the same, of course): and a conversion of bills payable into undivided profits is an indication of gain; for, if all other items remain the same, this must mean that a debt to outsiders has been paid off out of profits, *i. e.*, without impairing last year's assets, and so the free assets are so much the greater.

The principles discussed may well be applied at this point to imaginary reports of a number of different concerns, especially in a comparison of the solvency of those concerns.<sup>1</sup>

Now, to take these in order, we may examine the probable truth of the figures given. The first item worthy of attention is Real Estate with C D Co. We find this to be increasing year by year, and it happens that the increase each year, in the two years which we can trace on the balance sheets, is exactly equal to the sum spent for repairs. This looks a little suspicious, as if the firm were charging to the capital account what should have been charged to revenue; but unless we can get access to the record we can get no exact information. We must hold judgment in abeyance, therefore, until we see what general impression we can get of the trustworthiness of the books.

<sup>1</sup> For the figures see pp. 104 and 105.



In the merchandise account on the balance sheet of the C D Co., we find a rather rapid increase in the amount on hand at the end of the year. This is not in itself suspicious, but it should bear some relation to the amount of sales. We find the sales of this firm are increasing in the first year  $2\frac{2}{3}\%$ , but the stock on hand has increased  $25\%$ . In the next year the sales have increased less than  $4\%$ , but the stock on hand has increased  $20\%$ . The natural conclusion is that the firm is accumulating dead stock. The stock, moreover, is valued at  $100\%$  of cost. Even under the best of circumstances this is excessive. Yet this concern paid high prices: it took fewer discounts than its neighbors. In marked contrast is the condition for E. F., with whom the sales have increased  $25\%$  in the first year, but the stock on hand not at all. In the next year the sales have increased  $20\%$ , and the stock not at all. The conclusion is, inevitably, that E. F. is able to increase his sales without increasing his stock, so that he is either buying more skillfully or selling more vigorously. He values merchandise at a lower percentage and takes many discounts. A B Co. presents very much the same condition as E. F., though not in quite so striking a fashion.

C D Co. shows also a rapidly increasing amount of bills receivable and accounts receivable, out of proportion to the increase in sales. This is accompanied, moreover, by a considerable increase in the loss by bad debts, and by a rapid decrease in the discounts given. The conclusion is inevitable that many of its bills receivable are renewals or extensions, and that its customers are generally, as indicated by the few discounts given, of a class having inferior credit.

In the matter of fittings, C D Co.'s increase in the last year is without apparent reason. No part of the business shows need for an increase of store facilities. One has suspicions that it has arisen simply from "writing up" that account, or from charging repairs to capital.

C D Co.'s shrinkage of cash and increase in liabilities are at least suspicious.

A few comments are worth while in connection with the income sheet. Here we have no means of forming any judgment except by comparison. It is obvious that the discounts given in this trade are small or few; but, whereas A B Co. and E. F. have a business





of not more than twice that of C D Co., their discounts given are many times as great, and whereas the discounts which they have given are increasing, the discounts given by C D Co. are decreasing rapidly, indicating a poor class of custom; and whereas the discounts taken by C D Co. are very small and not increasing, the discounts taken by the others are increasing steadily. In other words, C D Co. is losing at both ends of its business, both on goods purchased and on sales.

These later conclusions regarding the condition of C D Co. rather confirm our early suspicion with regard to charges to real estate and to fittings. If, now, the doubtful items are to be "written off" the assets of C D Co. and then subtracted from the net earnings, as, of course, must be done if they have been charged to capital when they should have been charged to revenue, we get the rather striking conclusion that the net earnings for the year ending December 31, 1906, were not \$11,000, as reported, but only \$4000, and that the surplus, reported as \$8000, was really a possible deficit of \$500.

Before passing to the revision of the figures, to enable us to construct more accurate sheets than the ones offered, a few general comments are worth while. The A B Co.'s sales are for the last year 130% of its capital; the C D Co.'s, 160%; E. F.'s, 750%. In available assets and sales, A B Co. is holding its own and slowly improving, and is decreasing its outside debt; C D Co. on paper shows about the same condition of sales, but its assets are each year of a more doubtful character (bills receivable and accounts receivable, with less cash), and its liabilities are rapidly increasing; E. F. shows remarkable sales, and assets which, though slightly shrunk in amount, — suggesting a liberal writing off of the doubtful parts, — are rapidly changing in character from uncertain to secure (bills receivable to cash), and are set off against liabilities decreasing rapidly. A B Co.'s class of custom is improving, as indicated by the decreasing losses by bad debts and the discounts given; C D Co.'s is rapidly declining, with a decreasing expense to suggest incompetent or untrustworthy salesmen; E. F.'s is improving.

Let us now attempt to revalue the assets. The only doubt in the case of A B Co. is the valuation of merchandise. The percentage

of cost used, 95, is rather high, but the company has either written off some dead stock or managed to run along, with increasing sales, on a smaller stock; and we are therefore justified in passing it.

With C D Co. we find things far different. The merchandise is valued at 100% of cost, necessarily excessive; and that, too, in spite of evidence of accumulated dead stock and highest prices. We are justified in docking that item at least \$3000. The bills receivable and the accounts receivable, in view of the increasing losses incurred in the past few years, the indication of still poorer custom now on the books, and the excessive increasing basis of valuation actually used, should be reduced by at least \$2000 each. We are now justified in refusing to allow the full increase in real estate and in fittings, for the books have shown a false basis of valuation throughout. A liberal allowance for these would justify writing off at least \$1500 more, or \$8500 in all. When applied to the surplus of \$8000, we find a net result of \$500 deficit. Applying the same principles to net earnings, we shall consider about \$7000 of the \$8500 as belonging properly to the last year, leaving a net earning of \$4000. Of course these are but rough estimates and cannot be defended in exact detail, but any one asked to accept, as a basis for any credit transaction, the figures first given, would be obliged to offer some arbitrary scheme of reduction unless he could get access to the original documents.

Of E. F.'s affairs little is to be said. Though both bases of valuation are high, the improving conditions, the effective stock of goods, and the low figure of losses, justify us in taking it on faith.

The defective accounting of C D Co. illustrates a point previously mentioned. Sometimes a distinction is made between a balance sheet and a "Statement of Resources and Liabilities." Any difference that can exist between two such statements must be due to the fact that the books do not faithfully represent the conditions. The debit side of the balance sheet should be a statement of resources and the credit side should be a statement of liabilities; but such things as bills receivable and accounts receivable, though of doubtful quality, must appear on the books at face value. Necessary allowance can be made on the balance sheet without throwing the statement out of accord with the books. If each year a sum equivalent to the expected shrinkage in such items is subtracted

from income and credited to Allowance for Bad Debts (which will appear as a liability, of course), the balance sheet may exactly represent both the books and the conditions. Under this plan, losses suffered next year on this year's business would be debited to that account, and any discrepancy or excess between the estimated sum and the actual might furnish a basis for a better judgment in later years. Such discrepancy or excess might be closed into Loss and Gain of the year following the estimate, or it might be carried to the Surplus. So far as the difference is due to especially good or bad methods of collection, it belongs to the year in which the collections are made; so far as it is due to the goodness or the badness of the debts themselves, it belongs back with the last year's surplus or deficit.

A few other matters in connection with a balance sheet are worth considering at this point. Suppose a corporation shows a balance sheet with undivided profits of 20% of the capital stock and the assets are known to be conservatively figured. If the assets prove to be worth all they have been estimated as worth, can the firm go into bankruptcy? As a matter of fact, many firms have gone into bankruptcy under just such conditions. They had large accumulations of profits and those profits were real. Yet bankruptcy followed because the liabilities happened to be immediate and the resources remote. Sometimes a business growing rapidly and profitably is of such a nature that its liabilities are for early payment, whereas its resources are to be realized late. Book publishing on the subscription plan is a good illustration. Ultimately, however, in a case of this sort, a reorganization of the business will permit the payment of one hundred cents on the dollar. A balance sheet which gives no hint of the fact that the liabilities are immediate and the resources remote is not, therefore, entirely satisfactory. It should be so arranged that the "quick assets," as they are called, can be compared with the "current liabilities." It would be well to make the comparison upon the sheet, thus dividing the items into two classes, — long term and short term; but, in any case, the items should be so clearly designated that any intelligent reader of the balance sheet can make the comparison with a fair degree of accuracy. Illustration of this plan will be given in the chapter on railroad reports.

In this same connection it is well to bear in mind that certain funds set aside for specific purposes should be so invested that they may serve their purpose. For instance, a depreciation fund invested in real estate in a Western town that is awaiting a boom is not available to replace worn-out machinery in an Eastern factory. A depreciation fund that is somewhere in an unavailable form is in one sense no depreciation fund at all.

This matter of the availability of funds as "quick assets" has another interesting bearing. Suppose the balance sheet of a corporation shows a profit that justifies a 6% dividend, we will say \$60,000. The assets are as follows: certain real estate, valued at the city assessor's figure, which we assume in this case to be conservative; some bills receivable, of which none will become due in less than three months, but all known to be good; machinery and merchandise on hand, both valued conservatively; and \$5000 in cash. Should this corporation declare a dividend? The books show available profit of \$60,000, and yet there is but \$5000 in cash on hand. Has the corporation earned a dividend? Comparing resources and liabilities we find that it seems to have done so, because its resources are \$60,000 in excess of its liabilities; but where are those profits? They must be somewhere in the business; but the only possibility of distributing them is by borrowing to make the dividend payment. Would it be right to borrow money to pay dividends? There is a very strong feeling in most communities that to borrow money for such a purpose is always objectionable. A part of that feeling is mere prejudice. The fact of borrowing to pay dividends is in itself suspicious; but here, as in many fields, a suspicious fact is by no means indicative of bad morals or even bad policy. If the business management has actually on hand the assets reported, and if the liabilities are no greater than are reported, there is no objection to paying dividends by any method that shall prove feasible. The fact is simply that the profits earned have been invested in the business as they have come in; and hence they are not now available for dividends. If, instead of following this policy, the corporation had borrowed money to make improvements or new investments, no one would have thought of criticising harshly. Then the payment of dividends at the end of the year would have been taken as a matter of course. The only

difference between that policy and the one actually adopted is that the company in the latter case has saved interest from the time when the borrowing would otherwise have become necessary. In other words, if it would have been right for the corporation to borrow money to make investments, it is now right for it to borrow money to take up those investments, so to speak, and free the profits which were temporarily locked up. It is still true, however, that borrowing to pay dividends is to be looked upon with suspicion until one is sure, as we are in this case, that the profits were actually earned.

A device to avoid borrowing to pay dividends is the issuing of a scrip dividend. In this case certificates are issued stating that when presented in sufficient quantities, for instance, multiples of \$100, they will be redeemed in new stock. What has happened, then, is that instead of paying cash, the corporation has increased its amount of capital stock outstanding. There is commonly a cry against this sort of proceeding; but here, as in the last case, if the profits have been really earned there is no real ground for objection. No one can deny that if the corporation has earned profits that are in the form of ready cash it may distribute them. How far different is the case when, instead of saving the cash until the end of the year and distributing it to stockholders, who may pay it back into the corporation in payment for new capital stock, the cash is invested in the course of the year by the corporation and at the end of the year new stock is issued to the stockholders for the same sum? There is absolutely no difference in the two cases except in the names that are given to the different transactions, — unless in the first case subscription to new stock is voluntary and in the other compulsory. Clearly no stock-watering is here, for no water enters into the transaction. Always, however, before this process is undertaken, a corporation should consider the legal circumstances of the case; for many States, to protect investors against objectionable issues of scrip dividends and loans to pay unearned cash dividends, have provided very elaborate regulations and restrictions for all distributions except of cash profits. It is necessary to realize, however, that there are innocent as well as noxious ways of paying dividends without available cash resources.



## CHAPTER TEN

### THE GENERAL PRINCIPLES OF COST ACCOUNTING

THE discussion of the last three chapters has indicated some of the problems that accounting has to solve. We see by it that though the bookkeeping may be absolutely correct, that is, may produce correct balances and proper correspondence of debits and credits, unless good judgment is used in determining to what accounts items should be debited or credited and how the debits and credits should be interpreted, the results will be misleading or at least uncertain. We may now, having seen the sort of thing that we need, begin at the other end of the line and see by what processes we may get it. It is noteworthy that up to this point we have been concerned only with the value of resources and the amount of profits. Practically as important, however, is the question of the comparative productiveness of different sources of profit and the comparative expense of different methods or processes or services. We have still, therefore, to discover the general principles underlying the record of earnings and of cost.

The first problem in constructing a system of accounts is always this, — what separation shall be made between different sorts of revenue and different items of cost? The fundamental principle may be well exemplified by a very simple illustration, of a sort familiar to every one.

Suppose you are the owner of a sawmill, turning out nothing but boards with the by-products of edgings, slabs, and sawdust. Every revolution of the saw brings sawdust, edgings or slabs, and boards. If you keep no account of any cost except labor, fuel, and general expenses, and if you keep no account of receipts except the miscellaneous account of merchandise, you are far from knowing whether every part of your business is paying what it should. For example, the question must arise very soon in the operation of the mill whether it is better to sell the edgings, to dump them into the stream — provided you are not likely to get into difficulty with riparian owners, —

to burn them in a waste heap, or to burn them as a part of the fuel of the mill. If they are to be sold, they must be piled and possibly bundled, and then either shipped to the market or sold on the spot. Taking your mill as a whole, the general costs are returned by the general receipts, and it is impossible to say — just as it is impossible to say which half of a pair of scissors does the cutting — what exact share of the general cost should be borne by each part of the general product; but in this matter of bundling edgings, the cost pertains to the sale of edgings alone, and if you are to sell your edgings you must get *at least* enough to pay for that expense. If you do not know what that expense is, you do not know whether you are actually losing money in the sale of edgings beyond what it would cost you to throw them away or to burn them. Even in burning, there is probably some cost which would not be suffered if they were thrown into the water. The same thing is true of slabs. There are certain costs connected with piling and shipping that do not belong in any way with the cost of producing lumber; and therefore this cost must be kept distinct or you will not know your profit, — indeed, will not know whether you make any profit. So much for the simplest items of cost.

The same applies to keeping record of the receipts. If the price of edgings bundled is fixed at such a point in one year that the supply is not wholly carried off, it is desirable to fix a new price in the next year such that the supply will be taken off your hands. This price, however, must bear relation to the costs, and you must know at the end of the year whether the total receipts have met the total costs for that particular part of the product. Unless, too, the figures will show the effect of different prices upon the total demand, you never have a scientific basis on which to work for the future. Consequently, receipts from the sales of edgings should be kept as distinct from other receipts as should the cost of bundling edgings from other costs.

To summarize this matter, every cost which can be differentiated from other costs, and every receipt which can be differentiated from other receipts, should be so treated. Then it is possible to judge whether the cost is worth while, and whether the price must be regulated on a new basis.

The general principles of cost-keeping can be illustrated better,

perhaps, from the reports of railroads than in any other way. The railroad accounts of the country are better kept, probably, than accounts of any other sort, — in spite of the fact that there is a general complaint that they are not kept better than they now are. Even before the Interstate Commerce Commission was established, there had been a movement among railroad accountants and state railroad commissioners to bring about a certain uniformity in railroad accounts. The progress had not been very great, however, before the Interstate Commerce Commission was by law required to prescribe to the railroads the form in which their operations should be reported to that body. This form required by the commission is now the standard, and furnishes us many illustrations of the principles that should be applied to cost accounting. The present time happens to be one of transition, for a new classification went into effect on July 1, 1907.

The operating expenses of railroads, as distinguished from other costs such as interest, taxes, etc., have been until lately divided by the Interstate Commerce Commission into four groups, — maintenance of way and structures, maintenance of equipment, conducting transportation, general expenses. Each of these groups contains several accounts: the maintenance of way group has ten; the maintenance of equipment, nine; conducting transportation, twenty-seven; and general expenses, seven. By most of the railroads, moreover, these accounts prescribed by the Interstate Commerce Commission are still further divided so that some of the large railroads have more than two hundred accounts of operating expenses kept entirely distinct from each other, yet so arranged that they may be combined to produce the figures required by the Interstate Commerce Commission.

The purpose of this classification into four groups is obvious. There are three distinct kinds of railroad operating expenses, — the road, the rolling stock, and train movement. Maintenance of Way covers the road, Maintenance of Equipment covers the rolling stock, Conducting Transportation covers train movement, and General Expenses covers the indivisible expense pertaining to them in common. To put this in another way, if all trains were stopped, the group called Conducting Transportation would disappear. If all equipment were disposed of, Maintenance of Equipment would

disappear and yet Maintenance of Way and General Expenses must be continued if what is left is not to be allowed to suffer undue depreciation. Finally, the road may be leased and still much of the General Expenses will continue, for the financial side of the road, such as the payment of interest on bonds outstanding, of dividends on stock, of taxes, etc., must be attended to.

On July 1, 1907, the Commission provided a new classification, and now requires that these accounts shall be divided into five groups, differing from those under the old classification chiefly in the removal of items arising in the traffic department, such as traffic superintendence, outside agencies, advertising, etc., from the group called Conducting Transportation to a new group under the name of Traffic Expenses. This change is clearly in accordance with sound accounting principles, for the expense of getting traffic should not be confounded with the expense of conducting it. This new classification, moreover, increases the number of accounts in each group so as to include as follows: Maintenance of Way and Structures, 27; Maintenance of Equipment, 29; Traffic Expenses, 9; Transportation Expenses, 47; General Expenses, 11; a total of 123, as compared with 53 under the earlier plan. This provides accounts for great detail, as, for instance, a separate account for lubricants for yard locomotives, and one for damages for live stock killed or injured while crossing or trespassing on the right of way.

The classification of operating expenses into five groups on the common English plan, used until recently somewhat in this country, is interesting because it violates, to a certain degree, the main principles of cost accounting. This introduces, besides four groups similar to those comprising the earlier Interstate Commerce Commission plan, a group called Motive Power, pertaining solely to locomotives. To this group are carried items of repairs to locomotives, fuel, and wages of enginemen, etc.; it takes some items, therefore, from Maintenance of Equipment and others from Transportation Expenses. This is clearly less logical than the other, for expenses for enginemen and for fuel and for locomotive repairs are not essentially different in nature from the expenses for conductors and for illuminating oil and for car repairs. Proper accounting is based primarily on the *purpose* served, and only secondarily on the *object* with which the expense chances to be identified: this plan

reverses the order, and determines the chief groups by object and only the subdivisions by purpose; for though all the expenses included in the motive-power group are identified with locomotives, some are for the maintenance of property and others are for the momentary service of carrying particular bits of traffic. It is natural enough, therefore, that this classification should have practically disappeared.

Before we go on to discuss more in detail the five required groups of operating expenses, it is desirable to know that operating expenses are divided from another point of view into two classes, — first, those dependent upon the mere conduct of traffic, independent of the amount of it, and, second, those determined by the amount of traffic. Examples of the first sort, that is, expenses dependent upon operation but independent of the amount of traffic, are station agents, because an agent is necessary for each station, even though but one train a day is run, and general officers who are necessary for conduct of traffic, however great or small. Examples of the second kind, expenses dependent directly upon the amount of traffic, are engineers, firemen, conductors, brakemen, fuel, oil, printing, and stationery. We have still to indicate another class of expenses, hardly to be called operating expenses and yet to be met from the income, which are commonly called fixed charges. These are best illustrated by taxes and interest on debt. These three classes of expenses — fixed, semi-independent, and directly dependent — are not peculiar to railroads. They appear everywhere. The fixed expenses are common, as interest, taxes, etc. Of the semi-independent, those required by the mere conduct of business, but independent of its amount, are superintendents, watchmen, office boys, etc., for a business of \$50,000 may sometimes grow to one of \$500,000 and yet employ no more persons of this kind and pay no more office rent or expenses of commercial travelers. Finally, expenses of the third class, those dependent directly upon the amount of business, are common in all industries in the form of wages, fuel, teaming, etc. It is only because the distinction of classes is so much more apparent in railroads than in other lines of industry that we seldom hear of it anywhere else. All this is important from the point of view of accounting because it throws light upon the question of what accounts should be kept.

On many classes of goods railroads are accustomed to charge what is commonly said to be "what the traffic will bear"; and this means not necessarily that the roads charge all they dare to charge, but simply that these classes of goods are carried at a lower rate than others just because they cannot stand their proportion of fixed charges, — or even, perhaps, of what we have called the semi-independent charges. For example, logs for lumber and for pulp are so heavy and bulky that if a rate were made on them as high as on silks, no road could get any logs to carry; and, to a certain extent, the same thing applies to lumber, coal, ore, and grain. The road must pay its fixed charges whether it gets any freight or not; and it must pay its station agents, telegraph lines, general officers, section gangs, etc., whether it carries any of these bulky and heavy commodities or not. Any rate of freight on these bulky things, if it will pay direct charges — that is, the mere additional direct cost of carrying them plus a small margin of profit, — is worth while if the road can get no more. A freight transportation agency is carrying all the time much traffic that contributes nothing towards fixed expenses, and little, if anything, toward the second class of expenses. Those expenses must be covered by freight that can afford to cover not only its own share but the share of other classes. This will perhaps be more clear if we recur to the illustration of the edgings turned out as a by-product from the sawmill. Even though, perhaps, the edgings cannot be sold at a price which will help to pay interest on the investment and the wages and fuel of running the mill, rather than throw them away one should sell them at a price which will pay a small profit on the mere cost of bundling. It becomes necessary, similarly, for a railroad to know what is the actual direct cost of hauling traffic independent of any share in the indirect costs and fixed charges, in order that it may know what is the minimum rate at which it can afford to take traffic that can pay but little. Such traffic will be worth while if the other traffic will pay fixed and semi-independent charges.

Now let us see, by a simple illustration, how railroad charges are distributed among the numerous accounts. Suppose an engineer and a fireman devote the morning to running a train for a construction crew distributing ties for a strip of second track. The Interstate Commerce Commission has under the group Transportation Ex-

penses an account called Road Enginemen. The wages of this engineer and fireman seem to belong here; but when we realize that the new strip of track should be charged to capital and not to revenue, we see that the wages should go to some account that will be included ultimately in the principal assets account — Construction, or Cost of Road, as it is more commonly called. We find provision for this in the "Classification of Expenditures for Road and Equipment." Under the account entitled Track Laying and Surfacing, we find directions as follows: "To this account should be charged the cost of distributing, laying, spacing, and lining ties; . . . expenses of locomotives, cars, and crews distributing track material."

Suppose in the afternoon of the same day the same engineer and fireman are running an engine hauling a special train with coal for the company's use. Two important matters may be misrepresented if an error is made in charging their wages. If the wages are charged to the natural account under Transportation Expenses, that is, Road Enginemen, and no charge is made to fuel, the cost of fuel is understated, and by so much the road is likely to be misled as to the comparative economy of coal, coke, wood, and oil; again, since this cost will be included in the general costs of hauling freight, the comparison between costs and receipts from freight will be misrepresented. Either of two methods of charging will avoid the difficulty; one is to charge the wages for transportation of coal direct to fuel account, the other to charge them to Road Enginemen and then charge fuel account for freight at regular or reduced rates. It is better accounting to represent facts exactly, and at no stage to confuse revenue service with company service. This is the plan of the Commission.

If, the next day, these enginemen are engaged in running an engine to the repair shop and trying out another that has been repaired, clearly their wages should be charged not in the group Transportation Expenses, but in that for Maintenance of Equipment.

If on that afternoon they are engaged in switching cars in the yard, the charge should be made, under Transportation Expenses, to Yard Enginemen. The Commission's classification gives ten accounts for yard expenses. One purpose to which these may be put is to enable a manager to keep run of the adequacy or inadequacy

of switching facilities. If the tracks for making up trains are insufficient in number, a large waste is suffered in backing and pulling to arrange cars in such order that they may be dropped easily at their proper stations along the way. Is land for adequate terminal yards cheaper than heavy switching expense? Again, the question is likely to arise at any time whether it is cheaper to provide at a certain station an engine and a switching crew, or to have the switching done at that station by regular train crews who shall be delayed long enough to perform the switching for that station while *en route*.

Finally, if the enginemen are hauling an ordinary freight train on a single track line and are delayed so much by waiting at sidings to pass other trains that they finish their day's work two hours late and must be paid extra wages for that delay, the charge may then be made to Delayed Time, a subdivision (under Road Enginemen) not provided by the Commission. This account may serve, to a certain extent, to measure the probable saving from increased sidings and second, third, or fourth track along the line. Even to greater extent may it be set against the cost of additional train dispatchers and telegraph operators to report train movement.

These various charges of wages for enginemen sufficiently suggest that an accountant must look far below the surface in order to determine all elements of cost, for here to the superficial observer the men were doing identically the same work in all cases; and yet the disposition of the amount of their wages is an important element not only in determining profits, but also in the statistics by which the manager must determine his policy. In four of the five cases the charge comes out of revenue, and hence profits would not be affected if the wages were carried to any one of these accounts rather than to another; but any confusion would have hidden costs in conducting different parts of a railroad's service. In the first case, however, since charging to the natural account would have been to revenue, whereas the charge properly should have been to capital, it would have understated both the profits and the resources of the road.

Let us now take up the same sort of thing from a slightly different point of view. We have considered some accounts and what they stand for. Let us now take a simple case of exercise of judgment by



the manager, and, as a hint of what accounts must be kept, see what information he desires to get. Mr. J. Shirley Eaton, in his book entitled "Railroad Operations: How to Know Them," uses for illustration of one of his points the question of the best way to get a particular bit of passenger traffic. Is it better economy to run a passenger train, to add a passenger coach or two to a freight train (making what is called a mixed train), or to give up altogether the attempt to get the traffic? Let us use his illustration, adding a few elements for our particular purpose here.

The first question, of course, is as to the cost of the passenger train, which will be the maximum cost of carrying the traffic. This can be estimated fairly well from the figures of cost of fuel, engine-men, train service, maintenance of equipment, etc., with a few extra costs that may be involved in the service of gate-keepers, ticket-sellers, etc., for that particular train; for sometimes a train goes along at such a time of day that it involves extra hours or extra help for service along the road. Next we have to estimate the additional revenue from that particular train; and by this we mean not merely the earnings of that train, but the earnings of that train that the other regular trains could not get. For example, without such train it is possible that some of the traffic would be picked up by later or earlier trains if this one were not sent out. On the other hand, however, the revenue from a train may be greater than the earnings from that particular train. Some trains which are run at an apparent loss are continued because they make suburban towns possible for residence to people who, though they seldom use those trains, would refuse to live in the country at all if transportation were not available whenever their need may arise. Such trains, therefore, though they be usually almost empty, secure large suburban traffic both morning and afternoon.

We have now seen means of determining or estimating the cost of the passenger train and the probable revenue; and we have still to determine what would be the cost and probable revenue of the additional passenger coach or two on a freight train. The actual additional direct cost of the passenger car or two cannot be large, but some costs are likely to be forgotten. The obvious costs are extra fuel and extra stationery (for reports) and lights; but the danger of accident is greater on a freight than on a passenger train,

and this means so much greater cost, either direct or indirect, for loss and damage. It is difficult to stop a heavy freight train at any exact given spot, so that to stop a passenger car in front of the passenger platform involves more loss of power (or fuel), more wear, especially on brake shoes (or more delay in slowing down very gradually), or more risk to passengers if they are not set down exactly at the station. This last danger, which seems very trivial, is so great that most railroads refuse to sell tickets for stations at which trains are not advertised to stop, even though the trains are sure to stop near the station for water or for a grade crossing: railroads are liable for damages for a sprained ankle or other injuries if a passenger is not given a safe place to alight. Finally, it must be realized that the revenue from the mixed train is likely to be less than from a passenger train. It furnishes a less desirable mode of travel, enables a road to compete less well with other roads at competing points, and, since the conductor is occupied in looking after his freight, is less likely to yield correct fares. Only when all these things have been considered is the general manager in a position properly to determine whether such a train should be run or not. It is not true, of course, that in every case careful figuring of exactly these items is done, for a general manager from long experience has acquired a general knowledge which enables him to give quick judgment; but this experience upon which he bases his judgment was acquired originally through statistics derived from careful accounting.

It should be obvious, from these illustrations, that good accounting will distinguish and preserve as far as possible both the cost and the return of every product and of every service; for only thus can a manager know what sort of business he is really doing.

## CHAPTER ELEVEN

### THE PLACE OF STATISTICS IN ACCOUNTING

It must not be thought that accounting is always a matter of dollars and cents or of debit and credit figures. Many essential figures of accounting are not susceptible of translation into those terms; they are nothing but statistics preserved for business purposes.

Here, as in so many other cases, we can best illustrate the principles by recurring to railroad figures, for every one is familiar with the simpler facts of railroad operation, and railroad reports are almost the only full reports accessible for the average man's study. Some railroads furnish more than one hundred items of statistical information, and most of these are combinations of figures not published, which show much more detail for the use of the officers of the road. Some indication of these is likely to be well worth while.

Though no two statistical reports of railroads are alike, many items are common to all (perhaps given under different names) and many may be combined so as to produce results that may be compared for different roads. These statistics may be divided into four sections — passenger traffic, freight traffic, loading statistics, and cost statistics, — though they are not usually arranged in this way by the roads publishing them.

One of the first questions which any one asks himself about a railroad report in which he is interested is, Have the earnings been earned, or are they represented as greater or less than the facts warrant? Obviously, one of the first minor questions to consider in answering this main question is whether charges have been made to capital that should have been made to maintenance. Suppose the report shows that a certain number of cars have been purchased during the year and charged to equipment. At once the question arises whether the cars reported last year as on hand have been thoroughly utilized, and, therefore, whether the new cars were necessary. It is possible to learn from statistics of various roads

what is the average mileage of freight cars per year. In sections of the country where hauls are long, the average will be higher than where they are short, for loading and unloading will consume less time. If the report gives among the statistics, as it should, the number of freight cars and the total number of freight-car miles, it is possible, by a bit of figuring, to determine the average mileage per car. If this is considerably less than the average for other roads similarly situated, say ten thousand instead of twelve thousand, obviously either the cars are not being utilized and therefore new ones are not necessary, or the cars reported as among equipment a year ago were in such poor condition that the road did not dare to run them, but had them shunted off on side tracks to go to decay. In the first of these cases, the purchase of new cars was an unnecessary locking up of capital; in the second, it was a charge to equipment that should have been made to maintenance.

Other comparisons will assist one to form a judgment on the same question. Under normal conditions the cost of repairs per freight car should be about sixty dollars per year. If we know the equipment, we can easily determine about what should be the figure of maintenance for that one item. Again, freight-car repairs are normally about six mills per mile run. If we know the figure of car miles we can make an estimate on this basis. Similarly, figures are attainable for locomotive repairs (about seven cents) and for passenger-car repairs (about one cent). All such figures vary, however, in different parts of the country.

Maintenance of way can be properly judged only when we know how many new ties and new rails have been laid; most roads report them. Since rails last about eighteen years, and ties about seven, the average requirement for replacement may be easily figured.

It is often desirable to consider the comparative operating expense of two roads, sometimes when they are of similar standard and sometimes when of very different standards. This is obviously of no benefit unless we can get some information about the operating details of each road, — for example, in such a matter as loading, for this is one of the important criteria of economy of railroad operation. It is obvious that if the cars are not loaded to their capacity an unnecessary number are hauled over the road, requiring

extra fuel, extra train hands, extra wear and tear not only on the cars themselves but also on the roadbed, and an actually greater number of locomotives to do the hauling. The same thing will apply to the making up of trains, for to give a locomotive a smaller number of cars than it can economically haul is the same sort of evil as to give a car a small freight.

Often it is desirable to compare the operations of the road for one year with those for another year. If the earnings have fallen off, one naturally desires to know whether that reduction has been due to a reduction of rates, to a falling off in traffic, to an increase in expenses, or to a change in the character of traffic. Some roads, after carrying for a great many years traffic of a particular type, have found themselves, because of changes in their relations with other roads or of changes in industrial conditions, carriers chiefly of other kinds of goods. It is naturally a matter of time before accommodation to the new conditions is complete; changes in rates or in equipment may be required, but in any case a change in traffic is likely to produce a considerable change in gross and possibly in net earnings.

We may now take in detail some of the more common statistical figures reported. For passengers, a report should cover under the head of "number of passengers carried" the number of trips made by passengers. The "passenger miles" should show the sum total mileage of all passenger trips. The latter divided by the former gives the average number of miles for each passenger. These figures enable us to compare traffic of different years and of different roads. Then, for passenger earnings, we have the average paid by each passenger, the average rate per mile, the passenger earnings per mile of road (the total passenger earnings of the road divided by miles of road so as to show something of the density of passenger traffic), and the passenger earnings per train mile (indicating the average earnings from passengers for every mile traveled by a passenger train). The operation of passenger trains is indicated by such statistics as the following: passenger-train mileage; passenger-car mileage; the average number of passenger cars in a passenger train; the average number of passengers per train; the average number of passengers per car; locomotive mileage assisting passenger trains. It is obvious that the figures for number of passengers

in a train and in a car furnish some means of judging whether the accommodation furnished by the road is better than the conditions of traffic warrant. Unless a road is distinctly engaged in a competitive war or in building up the country which it traverses, its average number of passengers per train should not be far below the average for its class.

The same sort of principles is applied usually in freight statistics; but, from the nature of the case, they must be carried somewhat more into detail, since in the matter of freight the unit is not a single mile, and must include also the number of tons and the kind of goods transported. The chief freight statistics are as follows: tons hauled; ton miles (that is, the number of tons of each shipment multiplied by the number of miles it was hauled); average receipts per ton mile; average earnings per train mile; average earnings per mile of road; the number of tons transported of various kinds of staple goods. Some railroads report the tons of as many as fifty kinds of staple goods. This figure is obviously a benefit in enabling one to make a comparison between different roads and different years on the same road.

When we come to the conduct of this freight traffic, we find the freight-train miles, the car miles, the average number of cars in a train, and the average number of tons in a car, to be essential figures. Most roads do not adequately report their loading by directions. A little consideration will show that this is a matter of great importance. If the bulk of traffic is eastward, as it usually is, since crude products have their origin chiefly in the West, obviously the loading in the eastward direction should be the maximum, because, since the goods transported westward must be of a kind to occupy less space in the cars than that coming in the other direction, every ton of weight in cars and locomotives not properly utilized on an eastward-bound train must be dead weight on a corresponding westward trip. In spite of this requirement for the heavy loading eastward, however, since traffic does not distribute itself always in such a way that empty cars shall always be available at the points where wanted for the purpose of loading, it sometimes becomes necessary, in order to supply shippers with empty cars, to run cars from the nearest station where they may happen to be, and that may require eastward movement, so that a certain, but comparatively

small, empty-car mileage even in the eastward direction may prove necessary. To show that this is not excessive, a report should distinguish between loaded cars eastward and empty cars eastward. This enables us to judge at once whether presumably the best loading has been maintained. When we come to westward movement, on the other hand, the loading per car is of very slight consequence; for since, at best, many cars must go westward empty, whether the cars are loaded to the maximum capacity or not is a matter of indifference. The same thing is true of average load of loaded cars: we need to know the average load of loaded cars in the direction of heaviest traffic. Our real requirements are, therefore: first, the average number of cars in all trains; second, the average number of loaded cars in a train in each direction; third, the average number of empty cars in a train in each direction; fourth, the average number of tons of freight per loaded car in each direction. In judging comparative loading of different roads, allowance should be made for the class of traffic. Coal, for instance, stows well, and the loading of it should be limited only by the number of tons a car can support; but furniture stows badly, and for it the full capacity of a car may be far below the tonnage capacity. Hence a road getting the bulk of its traffic from the furniture district of Michigan would show a lighter loading than one operating in the mining district of Pennsylvania.

Many roads divide their freight into classes according to its origin; that is, the freight originating on the company's own line is distinguished from that originating with other roads and hence constituting through traffic. Again, roads must distinguish between company freight, so called, and revenue freight, — that is, between freight hauled for the road's own use and freight hauled for revenue. Often this is a matter of considerable importance, because the situation of the road may be such that its company hauling is a notable percentage of its total traffic.

It is obvious, from the figures already given, that much can be determined about the average daily movement of cars. Some roads, on the other hand, report elaborately mileage of freight cars not only on their own roads but also on foreign roads, including such things as the number of days home cars are at home, and the number of days home cars are on foreign lines, and the number of days foreign

cars are on the home line. Sometimes these statistics are very serviceable in enabling even an outsider to form some judgment of the management.

Some among many other items cited are gross earnings per mile of road; operating expenses per mile of road; average expenses per freight-train mile; average expenses per passenger-train mile; cost of coal per freight-train mile and per passenger-train mile; miles run per ton of coal; and cost of lubricating oil and waste per locomotive mile.

However many items of statistics are reported, in the records are kept hundreds more for the use of the general manager and other officers of the road. For instance, a common statistical table is what is called the locomotive-performance sheet, which on some roads records the performance daily of all locomotives upon the road, including the mileage traveled, the number of tons hauled, the consumption of coal, of oil, and of waste. This makes it possible to judge not only the amount of work done daily on the road, but to compare types and makes of locomotives and the efficiency of engineers. On some roads, this work is so carefully done that the weight of coal going into a locomotive is charged and the weight brought back is credited.

The determination of these statistics is not so great a task as might at first thought appear. For instance, every road must keep a careful account of all tickets sold by every ticket agent, in order that the ticket agent may be held responsible for his receipts. With a very little additional labor it is possible to figure the mileage on all tickets sold and cash fares paid. This, with proper allowance for other classes of passenger trips, furnishes adequate statistics for passenger travel. Similarly, all freight agents are held responsible to report shipments from and to other stations, and a little figuring gives the statistics on the basis of the reports. It is necessary, for various purposes, to keep run of car movement, and from conductors' reports car mileage and train mileage are easily figured.

A striking illustration of the value of statistics in factory accounting has been given by Mr. C. E. Woods, in his "Organizing a Factory." Mr. Woods became satisfied that in a certain shop the men were not performing all the work that they should. He constructed a graphic chart showing the earnings, per hour, for a year, of men



on piece wages. This showed a steady increase to a certain point and then a slow falling off, though there had been some revivals. The conclusion drawn from this was that the men were deliberately restricting their product for fear that their piece-rate would be cut down. The method of testing this theory was to install upon the engine an indicator showing how much horse power was consumed, and to record this consumption at intervals of every fifteen minutes during the day. In this particular case the total horse-power capacity of the engine was 1000. It was found that 530 horse power was employed to drive the transmission plant when no machines were running, — that is, to be ready for operations to begin at seven o'clock in the morning. After seven o'clock the amount of horse power consumed in the operation of the machines increased slowly, but it was not until eight o'clock that the full capacity was in use, — indicating sufficiently that some of the men were not really working until they had been in the shop an hour. By eleven o'clock the consumption of horse power had begun to decline, and at a quarter of twelve it was only two thirds of the total. In the afternoon the men were even slower in reaching maximum production; although the work was resumed at one o'clock, the total horse power was not consumed until half-past two, and decline in consumption began in considerably less than an hour and a half. At quarter of five, only two thirds of the power was in use. In other words, of a considerable portion of the labor and machinery of the shop, the concern was getting no return for four and a half out of nine working hours.

This discovery led to a reorganization of affairs, with the result — as indicated by the consumption of horse power — that an average of seventy-four minutes a day for each man of the sixteen hundred workmen was added to the working time. Of course, so far as the men were on piece-work, this did not affect their wages, but it did affect machine-cost. Every piece-work man was wasting not only his own time but the time of the machinery which the company was hiring him to utilize. For the day men, however, the loss was not only on idle machines, but on wages. About one half the men, that is, eight hundred out of sixteen hundred, were employed at day wages. The saving in their wages alone amounted to about \$60,000 per year.

The effect did not stop here, however. Mr. Woods was impressed with the large consumption of horse power when no machinery was running. The consequence was an examination and revolution of the system of power transmission. As a result there was a saving of \$4000 a year in power-cost.

Finally, the men being now obliged to work as many hours per day as they had been hired to work, a new standard of production was established. It was made evident that they could produce very much more than they had been producing, without working unduly hard, and the piece-rate was cut to such a figure that, although the men earned as much as before, there was a saving of \$26,000 a year due to increased production. There was a total saving, therefore, from these three sources of \$90,000, without including any saving of idle machine-cost, which must have been a considerable additional element.

These illustrations, from railroads and from a factory, sufficiently suggest the value of statistical information and the great number of subjects about which it may be secured. It is almost safe to say that in good accounting no figure that can be preserved should be destroyed. An accountant often finds valuable use for a figure that at first seemed meaningless, and information needed immediately is often unattainable simply because some figure that might easily have been preserved has been destroyed. This does not mean that a counting-house is to be swamped under disordered details. A thing not preserved in an orderly fashion is not worth preserving at all; but a little labor spent in arranging, labeling, and filing old statistical material may often prove a marvelous investment

## CHAPTER TWELVE

### THE RELATION OF PRINCIPAL AND INTEREST IN VALUATIONS

AN element of great importance in all valuations involving time is interest or discount. Both interest and discount are payment for the use of money; the fundamental distinction between them is that interest is a payment made at the end of a term of borrowing, and discount is a deduction made from principal at the beginning of a term of borrowing.

Simple interest is determined by multiplying the rate per year by the time in years and multiplying that product by the principal sum. That is, any two sums of interest at a particular rate will vary exactly in proportion to the time and the amount of the principal. The accumulation is purely by arithmetical progression. Compound interest, on the other hand, is interest in which the interest earnings of one year are allowed to accumulate and bear interest in the second and all subsequent years. That is, though at simple interest \$1000 borrowed for five years at 5% costs just five times as much as for one year, or \$250, at compound interest \$50 is charged for the first year, \$52.50 for the second year, and \$60.77 for the fifth year, — because the \$50 interest of the first year has borne interest four years, the \$50 interest of the second year has borne interest three years, and so on until the end, and in the fifth year interest must be paid on the accumulation, — so that the total interest is \$276.28, contrasted with \$250 of simple interest.

Several methods of figuring compound interest may be used. If the principal be multiplied by the rate, and the principal be added, the sum is the amount of the debt or other claim at the end of the first period; this is the same, of course, for compound as for simple interest, for compounding has not yet begun. If, now, this amount be again multiplied by the rate and the amount at the end of the first period be added, the result is the amount of the claim

at the end of the second period. This process may be continued for the full number of periods. It is better to think of periods than of years, for interest is often to be compounded semiannually or quarterly.

By another process, the amount of claim is figured directly without figuring the interest. Of course multiplying the principal by 1 reproduces that principal. Hence multiplying it by 1.05 gives the amount of the claim for one period at five per cent. By this method, therefore, the principal is multiplied by 1 plus the rate expressed decimally, and that product again multiplied by 1 plus the rate, and the process continued as many times as the number of periods requires.

Again, the rate (expressed decimally) plus 1 may be multiplied by itself, or raised to its second power. This gives the amount of one dollar at the end of the second period. This may be again multiplied by 1 plus the rate, that product again multiplied by 1 plus the rate, and so on until the number of periods has been provided for. This multiplied by the principal will give the amount for that principal at the end of the time; for the amount for one dollar multiplied by the number of dollars in the principal will give the amount for that principal. To express the same thing in another way, the rate plus 1 may be raised to the power indicated by the number of years which the claim has to run, and this multiplied by the principal will give the amount for that principal.

The principal plus interest is always technically known as the "amount." The amount minus the principal always gives the compound interest, of course.

It is obvious that if the number of periods for the compound interest is very great, the process becomes extremely tedious. In practice, where it has to be done very often, logarithms are used to reduce the work to a very few figures. By the use of logarithms it is possible to multiply or to divide or to raise to a power or to find a root by only two or three multiplications and divisions. The use of logarithms, however, involves a knowledge of mathematical principles which cannot always be assumed; and, therefore, this method will not be described here, though it is included in the illustrations given below.

PRINCIPAL AND INTEREST IN VALUATIONS

Method II

Principal	1000.00
Rate plus 1	<u>1.05</u>
	500000
	<u>100000</u>
Amount first year	1050.00
Rate	<u>1.05</u>
	525000
	<u>105000</u>
Amount second year	1102.50
Rate	<u>1.05</u>
	551250
	<u>110250</u>
Amount third year	1157.63 <sup>1</sup>
Rate	<u>1.05</u>
	578815
	<u>115763</u>
Amount fourth year	1215.51
Rate	<u>1.05</u>
	607755
	<u>121551</u>
Amount fifth year	1276.28 <sup>1</sup>
Principal	<u>1000.00</u>
Compound interest	276.28

Method I

Principal	1000
Rate	<u>.05</u>
Interest first year	50.00
Principal added	<u>1,000.00</u>
Amount first year	1,050.00
Rate	<u>.05</u>
Interest second year	52.50
Old amount added	<u>1,050.00</u>
Amount second year	1,102.50
Rate	<u>.05</u>
Interest third year	55.13 <sup>1</sup>
Old amount added	<u>1,102.50</u>
Amount third year	1,157.63
Rate	<u>.05</u>
Interest fourth year	57.88
Old amount added	<u>1,157.63</u>
Amount fourth year	1,215.51
Rate	<u>.05</u>
Interest fifth year	60.77 <sup>1</sup>
Old amount added	<u>1,215.51</u>
Amount at end of fifth year	1,276.28
Principal subtracted	<u>1,000.00</u>
Compound interest	276.28

<sup>1</sup> The taking of the half cent in long calculations is not excusable. The work should be carried back to many decimal places. Here, for instance, if we take the half cent for the third year the next amount is excessive by more than a half cent (for our multiplier is more than unity), and so on increasing. In even this short calculation for a small sum of money our result gives an error of one cent unless for the fifth year we drop the fraction in spite of its being more than a half cent. Usually the fractions dropped will equal the fractions taken; but with a multiplier more than unity a fraction more than a half taken early in the calculation will not be offset by a fraction less than a half dropped late in the calculation.

Method III

Rate	1.05
Rate	<u>1.05</u>
	525
	<u>105</u>
Second power of the rate	1.1025
Rate	<u>1.05</u>
	55125
	<u>11025</u>
Third power of the rate	1.157625
Rate	<u>1.05</u>
	5788125
	<u>1157625</u>
Fourth power of the rate	1.21550625
Rate	<u>1.05</u>
	607753125
	<u>121550625</u>
Fifth power of the rate	1.2762815625
Principal (multiplied)	<u>1000</u>
Amount	1276.28
Principal (subtracted)	<u>1000.00</u>
Compound interest	276.28 <sup>1</sup>

Method IV (logarithms)

log. of 1.05	0.0211893
number of periods (multiplied)	<u>5</u>
	0.1059465
	<u>3.0000000</u>
	3.1059465
	1276.28
Principal	<u>1000.00</u>
Compound interest	276.28

<sup>1</sup> This process looks longer than the others, but it is so only because it is carried (for the purpose of illustration) to an absolute accuracy. This shows the error of taking half cents in the illustration of the first and the second method; for under those we had to drop a fraction of more than a half cent at the end of the calculation in order to offset the half cent taken in the third year.

<sup>2</sup> In this case no advantage arises from using logarithms for the multiplication by the principal (1000), of course, because the case is so simple. The method is shown here merely for illustration.

Now let us turn to discount. This, as has been stated, is similar to interest, though not paid at the expiration of the period of borrowing but taken out at the beginning. The common discount of the business world is bank discount and differs in nature from theoretical discount, or, as it is called, true discount. A bank on discounting a note for \$1000 for sixty days at 6% takes out \$10 and gives the proceeds as \$990; but \$10 is the interest for sixty days for \$1000, whereas the bank loans only \$990; and, consequently, the bank is taking out discount for a larger sum than it loans. The true method of determining the amount of discount on \$1000 for sixty days is to find what sum of money invested for sixty days will produce \$1000 at the end of the time. If the true method is followed, the man who pays that note at the end of the time ought to be able by investing the sum which he has received from the bank to obtain at the end of the time exactly enough to take up the note, — provided, of course, he invested at the rate at which the bank discounted. If, however, a man invests his \$990 at 6% and then at the end of the sixty days takes the amount to the bank, he will find he will fail by ten cents to take up the note, for the \$990 will have earned but \$9.90 interest. The proper method, then, to determine theoretical discount, is first to find what amount \$1.00 will reach in the course of two months. If, then, we divide our principal, which in this case is \$1000, by the amount which \$1.00 will reach in sixty days, we shall find the principal which will be required to amount to \$1000 at the end of the time. In sixty days, at 6%, \$1.00 will earn 1¢ interest (for 6% per year is clearly 1% every two months). Dividing \$1000 by \$1.01 we get \$990.10, which is the true proceeds of \$1000 discounted for sixty days. Now if this sum is invested at 6% it will in sixty days earn  $\frac{1}{100}$  of itself, or \$9.90, which, added to our original \$990.10, produces the \$1000 with which we started. This \$9.90, then, is the true discount, as distinguished from the bank discount of \$10.00. In the matter of investments it is, of course, not bank discount but true discount with which we are concerned. Our business is to learn what sum of money invested for a certain time will produce certain other sums.

Compound discount differs in principle from simple discount practically as compound interest differs from simple interest. In

practically all business transactions it is understood that interest shall be paid periodically, usually annually or semiannually; and, therefore, in figuring what sum of money will accumulate to a certain other sum in the future, it is assumed that interest is paid at the end of each named period and usually that that sum is reinvested. Consequently, we are obliged in compound discount to take each period by itself and discount it to determine the preceding period. For instance, if we wish to learn what sum of money invested for five years, at 5% interest payable annually, would amount to \$1000, we must first learn what sum of money will in one year amount to \$1000. In one year at 5% \$1.00 will amount to \$1.05. Consequently, if we divide our \$1000 by 1.05 we shall get the amount which in one year will accumulate to \$1000, — that is, \$952.38. Now we must learn what amount invested for one year will produce \$952.38. We accordingly divide this latter amount by 1.05, producing \$907.03. It is obvious at this point that \$907.03 invested for two years will produce \$1000. We now continue our process and divide our \$907.03 by 1.05, and we get \$863.84, which is the sum that invested three years will produce \$1000. This, in turn, divided by 1.05 shows the amount which invested four years will produce \$1000, or \$822.70. Finally, dividing that by 1.05 we find the amount which, invested at the beginning of the five-year period, will, with interest payable annually at 5%, accumulate to \$1000 at the end of the five years, or \$783.53.

This amount is commonly called the present worth of \$1000 at 5% payable in five years. It is obvious that there is another method of producing the same result. If, instead of dividing our figure by 1.05 five times in succession, we find the amount which \$1.00 will reach when invested for five years at compound interest, we can perform our result with one division instead of five; but we have previously had to perform four multiplications. Thus, \$1.00 in one year will amount to \$1.05; in two years it will amount to \$1.10 $\frac{1}{4}$ , because the \$.05 interest of the first year will now earn  $\frac{1}{4}$  of 1% interest. In three years \$1.00 will amount to \$1.15763, in four years to \$1.21551, in five years to \$1.27628. Then, dividing our \$1000 by 1.27628 we get that sum which invested for five years at 5% will produce \$1000, which is, as shown by the other process, \$783.53.

It is interesting at this point to inspect a table which shall show



us both compound discount and compound interest for a few years, in order that we may see the relation between them. Let us apply, on the \$1000 basis, the figures we have just obtained for the compound interest of \$1.00. Obviously we have but to move our decimal point three places to the right in order to increase the amount for \$1.00 to the amount for \$1000, for if \$1.05 is the amount for \$1.00, \$1050 is the amount for \$1000. Now, combining these figures, — or the amounts for \$1000 given in the first two illustrations on page 131, — with the figures of compound discount which we have worked out, showing the present worth of \$1000 for five years, we obtain a table as follows:

\$783.53	5th present worth
822.70	4th “ “
863.84	3d “ “
907.03	2d “ “
952.38	1st “ “
1,000.00	Principal
1,050.00	1st amount
1,102.50	2d “
1,157.63	3d “
1,215.51	4th “
1,276.28	5th “

Now, since the relation between every amount here mentioned and the next lower one is the relation of \$1.00 to \$1.05, every sum here is the amount at 5% compound interest of the preceding sum for one year; and every sum here is the amount at 5% compound interest of the second preceding sum for two years; and every sum here is the amount of the third preceding sum for three years. Discounts can be shown in the same way. Every sum here is the present worth at 5% of the next lower sum for one year; of the second lower sum for two years; and so on. In other words, the relation is constant between present worth and amount, and the table may be read either upward or downward, beginning at any point, and the present worths and amounts will remain true.

In this table are practically all the mathematical principles involved in the treatment of investment; but the application of these principles is not always obvious. Perhaps the most common form in which this principle must be applied is that of the annuity, which though not appearing commonly under the name of an annuity is

involved in practically all transactions of investment. Occasionally an annuity is issued as such, though less commonly in this country than in England. An annuity may be defined as a periodical payment for a certain number of years or for the duration of certain lives, involving no repayment of principal; and it is called by this name even when the period is only a fraction of a year. The periodic payments are supposed to include the repayment of principal on the installment plan; and, therefore, each payment covers both interest and principal. For example, an annuity of \$1000 for ten years means that \$1000 shall be paid annually for ten years and then all payments shall cease, and no charge on account of principal shall remain. What is such an annuity worth? At the basis of such a calculation must be the market rate of interest on long-term loans where the security is of this class, that is, under similar conditions of safety. Of course, wherever the risk is greater or less, a higher or a lower rate of interest must be figured; and, therefore, to determine the value of an annuity it is necessary to use as a basis a rate prevailing under similar conditions of security. If market interest is 6%, a permanent annuity of \$6.00 is clearly worth \$100, for \$100 invested in the market will produce \$6.00. If, on the other hand, interest in the market is 5%, a permanent annuity of \$6.00 is worth \$120, for \$120 is necessary when invested at the market rate to produce \$6.00 in interest. If, again, the market rate is 10%, a permanent annuity of \$6.00 is worth only \$60, for \$60 will in the market produce \$6.00 interest. Let us in this case arbitrarily call the rate of interest in the market on security of this class 5%. Our problem, then, is this: What is the present worth at 5% of \$1000 payable in one year, of another \$1000 payable in two years, of another \$1000 payable in three years, and so on up to and including a tenth \$1000 payable in ten years? That is to say, for the first \$1000 payable in one year the buyer of the annuity is obliged to wait one year; for the second \$1000 he must wait two years; for the third \$1000, three years; and so on until and including the tenth \$1000, for which he must wait ten years. The present worth of an annuity of \$1000 for ten years, or, to express it differently, the price one must pay to-day to secure that annuity, is the sum of the present worths of \$1000 payable at the end of each year of the ten. A reference to the table given above shows the present worths of \$1000 at 5%, to be as follows:

One year,	\$952.38
Two years,	907.03
Three years,	863.84

The total of such figures for ten years, or \$7721.73, is the figure we are seeking.

There is also, of course, the reverse problem, that is, how large an annuity for ten years will a certain sum of money buy, say \$25,000. Let us find a method. A sum paid now is worth, of course, more than a sum payable one year in the future; or, to express it differently, one dollar payable in one year will cost less than one dollar paid down. A sum considerably less than \$1.00 will, if invested to-day on the 5% basis, produce at the end of the year \$1.00; or, to be exact, \$.95238 will, paid down to-day, produce \$1.00 at the end of the year. Similarly, \$.90703 will, paid down to-day, in two years produce \$1.00; and in three years \$.86384 will produce \$1.00. The same process continued through the ten years shows how much it is necessary to invest now to produce \$1.00 at the end of each of the ten years. The total of this column of figures, or \$7.721735, is the present worth of the annuity of \$1.00 for ten years. Then our \$25,000 to be invested divided by the total which it will cost to buy an annuity for \$1.00 will show for how many dollars \$25,000 will buy a ten-year annuity on the 5% basis, — or \$3237.61.

We can find now the valuation of bonds. Suppose the market rate on long terms on investments of a certain class is 4%. What is the value of a bond for \$20,000 par value, payable in twenty years, bearing 5% interest? This value may be determined by either of two methods. We may divide the bond into two parts, principal and interest, and then determine the present worth of each for the duration of the bond, or we may determine the present worth of the interest alone, measuring it by the excess of the bond rate over the market rate.

On the first method, the principal, payable in twenty years, must have to-day a present worth of the par value less twenty years' compound discount. We must now note that the rate of interest named in the bond is of no concern to us except as an index of the amount of annuity that the bond yields. On a \$20,000 bond, 5% means an annuity of \$1000, and it means nothing more. It does not necessa-

rily mean 5% on the investment, for the bond may have cost more or less than \$20,000. In determining what the bond is worth, we must figure discount at the market rate; for our only criterion for knowing what the bond is worth is a comparison of it with other investments. If the market rate is 4%, as assumed here, we must figure discount, to determine present worth, at that rate. The present worth at 4% of \$20,000 due in twenty years is \$9127.74, as figured by the process indicated on page 134. This is the first item of our valuation. We now have twenty annuities of \$1000 each, payable at yearly intervals, to add to the principal. These also, of course, must be figured at the market rate of 4%. The method is that shown on page 136, finding the sum of the present worth for each of the twenty annuities. The total is \$13,590.33. The bond is worth, then, as follows:

Present worth of principal, payable in twenty years,	\$9,127.74
Present worth of annuities, for twenty years,	<u>13,590.33</u>
Value of bond	\$22,718.07

The premium is this amount less the principal of \$20,000, or \$2718.07.

To understand the second method of determining the value of this bond we must recognize that if the rate of interest were the same as the market rate, the duration of the bond would be a matter of no consequence. A loan at the market rate bears neither premium nor discount. We do not need, therefore, by this method, to take into account the present worth of the principal. We have merely to compare the rate of interest borne by the bond with the market rate, and consider any excess or deficiency to be the sole factor in determining the premium or discount on the bond. In this case the bond pays \$1000 interest per year, but at the market rate the interest upon the principal of the bond would be but \$800 per year. This bond, then, assures to the holder an annuity above normal interest of \$200 per year for its twenty years' duration. The present worth of an annuity of \$200 for twenty years, therefore, is the premium on the bond. This figure added to the principal should correspond exactly with the figure of valuation of the bond by the other method, and except where odd cents have been lost in the figuring, as is likely to happen unless the calculation is made very fine, the results will be identical. The present worth of an annuity of \$200 for twenty

years at 4% is \$2718.07. This is the premium. The total value, therefore, is \$22,718.07, as found by the other method.

Let us now add another element. Suppose the bond draws interest semiannually. Then there will be forty payments of 2½% instead of twenty payments of 5%. The bond is now clearly worth more than before, for the holder instead of waiting a year for his first interest receives one half of it at the end of six months, and that six months' interest may be reinvested. The increase in value due to this shorter interest payment is equivalent, therefore, to interest for six months on every second interest payment. That is to say, one half of the first year's interest being received at the end of six months earns interest until the end of the year. Then the other half-year's interest earns interest exactly as under the annual payment plan. Then a third interest payment is made, and this can be put at interest until the time for the fourth payment, which is as it would be under the annual plan. So it is every second interest payment which may be reinvested and earn more than under the annual plan. The difference is actually, at 6%, such that a bond yielding \$60.00 on the annual plan will produce \$60.90 when interest is payable semiannually, \$61.36 when interest is payable quarterly, and would produce \$61.68 if it were payable monthly.

So far we have taken simple cases of value for a definite moment of time, and so far the principles are complete. When we come to register values upon books, however, we meet a new problem. Suppose we have bought a five-year 5% bond with interest payable semiannually, of the par value of \$200,000, when the market rate on long time for money loaned on security of this class is 4%. As has already been seen, the value of this bond can be determined by taking either: (1) the present worth of the principal of the bond payable in five years, plus the present worth of the annuity (the amount of interest) for five years; or (2) the present worth of an annuity of \$1000 for ten periods, payable at six-month intervals, — for since the market rate is 4% and this bond bears 5%, it yields every half-year \$1000 more than the market rate upon the par value of the bond, that is, \$5000 instead of \$4000. In either case the premium is \$8982.59. We must remember why this bond bears a premium: the bond constitutes a claim for interest at higher than the market rate for a definite number of periods. When the number of periods

shrinks, the value of the bond shrinks. When the first of the ten interest payments has been made, but nine remain; and the bond is no longer a claim for ten annuities. Of course, only the par value, and not the premium, is to be paid at maturity. In a sense, therefore, each interest payment includes, besides the market rate of interest, a return of a part of the premium; and, therefore, the premium remaining, after each interest payment, must be reduced upon the books, or the figures will not properly show the value of the bond. The problem is to determine at what rate or on what basis this depreciation on the value of the bond shall be written off the books. This writing off of depreciation is called "amortisation," and for every investment at any figure above par an amortisation table should be constructed showing what amount of the cost value should be at each period written off. Amounts to be written up if the bond was bought at a discount are called "accumulations."

Several methods of constructing such an amortisation table may be followed. We will take the most simple first. It was assumed in the case before us that the market rate of interest was 4%. The investor expects, therefore, that his bond, if it is worth the premium which he paid — namely, \$8982.59, — shall produce for him 4% upon the total investment of \$208,982.59. Unless he gets more than 4% upon that investment he receives nothing which can be called amortisation, for he has received back no part of his premium; but whatever he has received in excess of that sum must be amortisation. His bond pays him in the first half-year \$5000; but 2% semiannual interest on his original investment would amount to only \$4179.65. The difference between the two, which is \$820.35, must be return of principal invested; and, therefore, is the figure of amortisation for the first year. We must now show on the books that our bond has shrunk in value \$820.35, that is, to \$208,162.24, or, to express it differently, we must show on the books that \$820.35 of principal has been paid off, and, consequently, only \$208,162.24 of the original investment still remains in the bond. This last figure is called the "book value."

Six months later the investor is entitled on the 4% basis to 2% on that portion of the investment still remaining in the bond, which we have already seen to be \$208,162.24. Since, this half-year, he receives in bond interest \$5000, and interest on his investment is

but \$4163.24, the difference, as in the former case, is a payment on account of premium and should be amortised, or subtracted from the former valuation of the bond. This may perhaps best be made clear by a table for the whole period of five years or ten interest payments. After the explanation above, the table should be readily intelligible.

Date	5% Bond Interest	4% Interest on Last Book Value	Amortisa- tion	Book Value
1908 Jan. 1				\$208,982.59
July 1	\$5000.00	\$4179.65	\$820.35	208,162.24
1909 Jan. 1	5000.00	4163.24	836.76	207,325.48
July 1	5000.00	4146.51	853.49	206,471.99
1910 Jan. 1	5000.00	4129.44	870.56	205,601.43
July 1	5000.00	4112.03	887.97	204,713.46
1911 Jan. 1	5000.00	4094.27	905.73	203,807.73
July 1	5000.00	4076.15	923.85	202,883.88
1912 Jan. 1	5000.00	4057.68	942.32	201,941.56
July 1	5000.00	4038.83	961.17	200,980.39
1913 Jan. 1	<u>5000.00</u>	<u>4019.61</u>	<u>980.39</u>	200,000.00
	50000.00	41017.41	8982.59	

Proof

Cost of bond	\$208,982.59	Bond interest	\$50,000.00
Par	<u>200,000.00</u>	Interest on investment	<u>41,017.41</u>
Premium	8,982.59	Amortisation	8,982.59

This table probably needs no explanation; but its meaning may well be reviewed by a statement of just how it was constructed. We had at the start just three facts — the cost of the bond, the rate of interest on the bond, and the market rate of interest. All the other figures are derived from these. Since the bond interest is constant, the first column may be filled at once. Next, 2%, or the interest for a half-year, is figured on the cost of the bond, that is, the original book value. The difference between bond interest and market interest (4% basis) is the amortisation. The last book value less the amortisation is the new book value. For the next period the market rate is applied to this book value, and the difference between that interest and the bond interest is the amortisation for that year; and so on to the end.

The reverse of this process would be adopted for bonds bought

at a discount. Here, instead of amortisation, there would be accumulation, that is, a steady increase in value due to the nearer approach of the day of payment; for, since the bonds were bought at a discount and the par value is to be paid at the expiration of the term of the bond, every period sees an increase in value as the day of final payment approaches.

Under a table either of amortisation or of accumulation, it is obvious that if one buys the bond at a correct price at any stage during the process the value which he should pay is the book value as recorded in the table, and the table will remain correct for the rest of the life of the bond; for in each case the interest on the 4% basis has been figured on the book value for the preceding period, and that furnishes the amortisation and in turn the new book value, so that at the end of the time the book value, whatever it is, will have been amortised.

If, during the life of the bond, the market rate of interest should change, the amortisation schedule cannot be changed to correspond, for since the purchase was on a different basis, a new rate will not amortise at maturity. The only effective method of registering a change in the market rate (but, of course, it is only the market rate on long terms that concerns amortisation tables, and that does not change often) is to charge or credit to profit and loss any difference between the old book value and the value of the bond determined anew by the methods already described on page 137. Then a new amortisation schedule, based on the new rate, must be made for the unexpired time of the bond so that par shall be attained at the end of the time. To illustrate, if, at the end of the five periods, when the book value is \$204,713.46, the rate of interest in the market falls to  $3\frac{1}{2}\%$ , this bond will be worth more than before, for its interest is now really an annuity for \$1500 per half-year instead of \$1000 (\$5000 bond interest less \$3500 market interest). Its value will be \$207,121.78. This sum is now to be amortised in five periods, by a new table displacing that previously worked out. To make the correction in book value for the first item of the new table, profit and loss account is credited for \$2,408.32, and the bond account is debited by the same sum, showing increased valuation.

It may be worth while, before passing on, to note that the precision with which the amortisation schedule exactly writes off the original



premium may look suspicious. If our suppositions are correct, however, it is bound to work with complete accuracy. We exactly determined the rightful premium of the bond by careful calculation of the amount of accumulation of excess interest over the market rate, showing \$8982.59. If now we reverse the process and see how much each half-year we are getting on the 4% basis and subtract that from the amount paid by the bond on the 5% basis, we must as inevitably destroy the premium of \$8982.59 as in the other case we built it up. Such a schedule worked out on the plan given cannot fail to produce a correct result, unless by some dropping of fractions, in the disregard of portions of a cent, the scheme is to a minute degree thrown out of balance.

A short cut for working out an amortisation schedule may be worth mention here. A reference to the schedule already given will show that the column of amortisation gives sums each of which is 102% of the sum before it. In other words, if each amortisation were put at interest on the 4% basis for the succeeding half-year, it would produce at the end of that succeeding period exactly the sum which is at the end of that period amortised from the interest payment. The reason for this is evident. Each amortisation decreases the book value, and hence decreases the 2% interest on the book value. Since the bond interest is constant, and the market interest is reduced each time by 2% on the last amortisation, each amortisation is 2% larger than the one before it. When, then, our first amortisation has been determined, the column may be filled out at once by adding 2% each time.

Indeed, it would be possible to work out an amortisation table without a knowledge of even the book value, if only the premium were known, — however big the par value might be. All we need to know is what annuity invested at the market rate for the required number of periods would amount to the premium. It is easy to determine the sum that an annuity of \$1.00 will amount to. The required sum divided by the amount of a \$1.00 annuity will give the required amortisation. To illustrate it here, an annuity of \$1.00 will for ten periods at 2% attain to  $\$10.94\frac{9}{100}$ . Our premium, \$8982.59, divided by this sum gives us \$820.35, our first amortisation. For one accustomed to the use of logarithms, all this figuring is comparatively easy, though sometimes tedious. Elaborate interest and

annuity tables have been published to make the figures attainable for all.

Up to this point the assumption has been that the purchase was made on an interest date, and that the book value is preserved on the books as of such a date. The actual conditions are often otherwise; for, first, bonds are bought between interest dates, and, second, books are intended to show valuations at the end of fiscal years. In either or both of these circumstances a somewhat different schedule of amortisation must be provided. The difference between such a schedule of amortisation and the one given above is based on the fact that the natural time to value a bond is at an interest date; for interest is compounded at interest dates and at no other time.<sup>1</sup> Purchasing or selling or valuing a bond at any other time theoretically involves allowance for compounding the interest at an extra time,— say two months after the last interest date instead of six. In practice, however, since the computation is somewhat laborious and the difference small, the interest and the amortisation are usually taken as a proportion of the total interest and amortisation of the whole period, — say, for two months, one third the figure for the half-year in which it occurs, — using as a basis the book value at the last interest date. If, for illustration, we assume the bond already discussed on page 141 to be bought on February 1, we find the amortisation for the first half-year to be \$820.35, and the interest to be \$4179.65; and the amortisation and the interest on February 1 will be \$136.72 and \$696.61, respectively, or one sixth. This amortisation subtracted from the January book value gives the book value for the day of purchase, February 1. We start our amortisation table at this point, therefore, and continue it exactly like the schedule above except that the July items will have been reduced by the amount of the February items, as follows:

<sup>1</sup> This is not merely a theoretical compounding, but may be actual. Interest money paid may be invested and at once begin to earn interest. That is true compounding, and the possibility of it is the only warrant for figuring theoretical compound interest.

Date	5% Bond Interest	4% Interest on Last Interest- date Valuation	Amortisa- tion	Book Value
1908 Feb. 1				\$208,845.87 <sup>1</sup>
July 1	\$4,166.67 <sup>1</sup>	\$3,483.04 <sup>2</sup>	\$683.63	208,162.24
1909 Jan. 1	5,000.00	4,163.24	836.76	207,325.48

When, as already suggested, an amortisation table must be constructed to show valuation at dates other than interest dates, as at the end of fiscal years not corresponding with those of the bonds, another device must be employed. Let us suppose that, with the firm holding the bond figured above, the fiscal year ends March 31. We then desire a valuation for April 1. This would be figured as we figured the February valuation, or just halfway between the valuation for January and that for July, or \$208,572.42. The time elapsed since February 1 (the date of purchase) is one third of a half-year, and the bond interest, the earned interest, and the amortisation, consequently, will be one third that for the half-year, or \$1666.67, \$1393.22, and \$273.45, respectively (based, as were the February figures, on the January book value). Now that we have once timed our valuation to accord with the fiscal years, however, we do not need again to figure valuation at interest dates until the bond is sold or reaches maturity. We can, if we wish, keep our valuation at this fixed interval from the valuation at interest dates, making a schedule for this purpose. Here, for instance, since our April valuation is midway between that for January and that for July, we may keep the figures of our new schedule constantly midway between those of the other, showing valuation for April and for October only. To be sure, the bond interest will not be received on the dates mentioned, but our entry of that interest in the schedule is not to enable us to keep run of interest collections but solely to show

<sup>1</sup> This calculation is concerned with only the capital portion of the bond, and takes no cognizance of interest accrued. The market value on February 1 would be this book value plus one month's interest. The bond interest for July 1, similarly, is here entered as for only five sixths of a half-year, though \$5000 will be paid at that time. The purpose of this interest column is solely to show how much *annuity* has been received on capital *investment*; and in this case \$833.33 is supposed to have been paid in advance out of the \$5000 to be received.

<sup>2</sup> This figure is taken on the basis of the January book value, as indicated above, for the half-year was arbitrarily divided; and since the first portion was taken on that basis, the second must be similarly figured.

what amortisation to record; and, for this purpose, the actual date of receipt is of no consequence. Our schedule will therefore run as regularly as our first except for the short initial periods and the short final period, — though of course the figures will be different (since the dates of the book values will be different). The only complication is the possibility of error in failing to note that the interest for the last short period is based not on the last, or October book value, but on that for July, just as the first April valuation was based on that for January. The reason is this: we have started our table with a halfway figure, midway between valuations at interest dates; our subsequent amounts for interest and for amortisation, since they were based on the last book value, lay half in each half-year, — included half the interest and half the amortisation of the first half-year and half those of the second half-year; consequently, when we figure finally for January, 1913, we must figure interest and amortisation not on the last October value (which took account of only half the July-January interest and amortisation) but on the July book value itself, so as to include all that belongs to the year. The schedule below gives complete figures for quarters, with the April and October figures based on the values for January and July; below it is another schedule showing the April and October figures only. A comparison of the two tables shows the relation between them; especially if one notes that the interest and the amortisation of the second schedule are equal to the sum of unlike quarter-years of the first, so that the figures for January, 1913, must be based on the July book value.

PRINCIPAL AND INTEREST IN VALUATIONS

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Date	5% Bond Interest	4% Interest on Last Interest-date	Amortisa- tion	Book Value
1908 Jan. 1				\$208,982.59
Feb. 1	\$ 833.33	\$696.61	136.72	208,845.87
Apr. 1	1,666.67	1,393.22	273.45	208,572.42
July 1	2,500.00	2,089.82	410.18	208,162.24
Oct. 1	2,500.00	2,081.62	418.38	207,743.86
1909 Jan. 1	2,500.00	2,081.62	418.38	207,325.48
Apr. 1	2,500.00	2,073.25	426.75	206,898.73
July 1	2,500.00	2,073.26	426.74	206,471.99
Oct. 1	2,500.00	2,064.72	435.28	206,036.71
1910 Jan. 1	2,500.00	2,064.72	435.28	205,601.43
Apr. 1	2,500.00	2,056.01	443.99	205,157.44
July 1	2,500.00	2,056.02	443.98	204,713.46
Oct. 1	2,500.00	2,047.13	452.87	204,260.59
1911 Jan. 1	2,500.00	2,047.14	452.86	203,807.73
Apr. 1	2,500.00	2,038.08	461.92	203,345.81
July 1	2,500.00	2,038.07	461.93	202,883.88
Oct. 1	2,500.00	2,028.84	471.16	202,412.72
1912 Jan. 1	2,500.00	2,028.84	471.16	201,941.56
Apr. 1	2,500.00	2,019.42	480.58	201,460.98
July 1	2,500.00	2,019.42	480.58	200,980.40
Oct. 1	2,500.00	2,009.80	490.20	200,490.20
1913 Jan. 1	2,500.00	2,009.80	490.20	200,000.00

Date	5% Bond Interest	4% Interest on Book Value <sup>1</sup>	Amortisa- tion	Book Value
1908 Feb. 1				\$208,845.87
Apr. 1	\$1666.67	\$1393.22	\$273.45	208,572.42
Oct. 1	5,000.00	4,171.44	828.56	207,743.86
1909 Apr. 1	5,000.00	4,154.87	845.13	206,898.73
Oct. 1	5,000.00	4,137.98	862.02	206,036.71
1910 Apr. 1	5,000.00	4,120.73	879.27	205,157.44
Oct. 1	5,000.00	4,103.15	896.85	204,260.59
1911 Apr. 1	5,000.00	4,085.22	914.78	203,345.81
Oct. 1	5,000.00	4,066.91	933.09	202,412.72
1912 Apr. 1	5,000.00	4,048.26	951.74	201,460.98
Oct. 1	5,000.00	4,029.22	970.78	200,490.20
1913 Jan. 1	2,500.00	2,009.80	490.20	200,000.00

<sup>1</sup> It will be noted that interest and amortisation for Apr. 1, 1908, and Jan. 1, 1913, are figured on the book values for the last interest dates, Jan. 1, 1908, and July 1, 1912, respectively; for only a part of the bond interest for the current half-year has at these points been apportioned between interest and amortisation, and the rest must now be apportioned. The interest on all other dates is based on the last book value, — which is midway between book values on interest dates, — and is the same as the sum of the figures for the two corresponding quarters of the preceding table.

Always, it is to be noted, the market rate, or basis, considers the element of risk. On many bonds a basis of 7% is not too high. The basis is the market rate for bonds of that degree of security, and as the judgment of security varies, so varies the basis rate. Of two bonds of identical terms (say, twenty-year term, with interest at 5%) one might be judged to be worth a high premium, because judged on a 4% basis, and the other to be worth much less than par, because judged on a 6% basis.

Up to this point, it has been assumed that the price of the bond was determined on a known market basis. Altogether common is the reverse condition, under which we must determine the market basis from the known price; for often bonds are sold at an arbitrary figure, determined by market conditions, and this is taken as an indication of the esteem in which the market holds such bonds, that is, determines the market basis. Whether it is possible to ascertain the exact return, in percentage, that a purchaser will get from a bond at a known price depends upon the meaning attached to the word "return." Sometimes this is made to include a supposition of reinvestment of the amortised premium. In such a case, assuming a fixed rate on reinvestments, the rate of return can be mathematically determined. Otherwise it cannot, for mathematicians have not learned how to solve equations containing unknown quantities of high degree. The usual means of approximating the unknown rate is reference to published bond tables. These show the value of bonds of different terms and at different rates, figured down to great detail — by the methods described above. When one has found the valuation nearest to the price actually paid for a bond, a reference to the table shows the approximate rate. Such residue or discrepancy as may occur can then be amortised by adding or subtracting a proper sum at each step in the amortisation process (divided equally between the periods, or proportionally divided according to the amount of each amortisation), or if small it may be disposed of wholly in the first amortisation so as to leave a simple schedule for the rest of the duration of the bond. Thus with the bond discussed above if the price paid was \$209,000.00, instead of \$208,982.59, assuming a market quotation of 104½, a residue of \$17.41 must be amortised. This might be added to the first amortisation, giving \$837.76 and thereafter a straight table at 4%; or the \$17.41 might

be divided into ten equal parts, giving \$1.74 to be added to each semiannual amortisation; or, to be exact, we might divide our total amortisation, \$8982.59, by our residue, \$17.41, and add to each semiannual amortisation its proportion according to its size, *i. e.*, for the first,  $8982.59 : 820.35 :: 17.41 : x$ . A method of finding the exact market basis on the assumption of a fixed rate for reinvestments will be found in Appendix F, page 330.

We have now remaining the important question of the treatment of amortisation when the income belongs to one person and the principal to another. This is likely to happen in the case of a trustee who is to administer a fund in such a way that one heir is to receive the income of the trust for his life and then the principal is to be turned over to another heir. Let us suppose, in order to make our case simple, that the trust fund is wholly invested in the bond which we have been examining. How much shall the trustee pay annually to the person holding the life interest? Clearly, if the trustee pays the life-man too much in any year, unless it be recompensed in later years, the remainder-man, at the death of the other, will receive a principal which has been impaired; but, on the other hand, if the trustee gives the life-man too little, the remainder-man inherits what the life-man should have realized during his lifetime. It is the trustee's business to see that each gets his exact share.

The interest on the bond is \$5000 per half-year,  $2\frac{1}{2}\%$  on \$200,000; but if the life-man is given this \$5000 each half-year and chances to live exactly until the bond matures and no longer, the remainder-man will inherit only the principal of the bond, or \$200,000, although the estate was originally \$208,982.59. In other words, the life-man has been given \$8982.59 of principal, although he was entitled to nothing but income. The real income, therefore, is not \$5000 each half-year, but the interest less a certain annual proportion of the premium, or the amortisation.

A device obvious and easy, though not necessarily quite just to both parties, is to pay the life beneficiary 4% on the original investment, which was \$208,982.59, or \$4179.65 each half-year, and to put the annual amortisation, received out of each interest payment of \$5000, at interest to accumulate for the remainder-man.

This would work out in an interesting way.

## ACCOUNTS

Date	Bond Interest	Paid Life-Man	Added to Sinking Fund for Amortisation	Interest Earned by Sinking Fund	Total Increase in Sinking Fund	Amount of Sinking Fund	Book Value
1908 Jan. 1	\$5,000.00	\$4,179.65	\$820.35		\$820.35	\$820.35	\$208,982.59
July 1	5,000.00	4,179.65	820.35	\$16.41	836.76	1,657.11	208,162.24
1909 Jan. 1	5,000.00	4,179.65	820.35	33.14	853.49	2,510.60	207,325.48
July 1	5,000.00	4,179.65	820.35	50.21	870.56	3,381.16	206,471.99
1910 Jan. 1	5,000.00	4,179.65	820.35	67.62	887.97	4,269.13	205,601.43
July 1	5,000.00	4,179.65	820.35	85.38	905.73	5,174.86	204,713.46
1911 Jan. 1	5,000.00	4,179.65	820.35	103.50	923.85	6,098.71	203,807.73
July 1	5,000.00	4,179.65	820.35	121.97	942.32	7,041.03	202,883.88
1912 Jan. 1	5,000.00	4,179.65	820.35	140.82	961.17	8,002.20	201,941.56
July 1	5,000.00	4,179.65	820.35	160.04	980.39	8,982.59	200,980.39
1913 Jan. 1	5,000.00	4,179.65	820.35				200,000.00



At the close, the face of the bond, \$200,000, is paid, and the sinking fund amounts to \$8982.59, — the two yielding \$208,982.59, the original investment, preserved for the life-man.

This looks admirable and is so if it works. The only doubt about it is the earnings of the sinking fund. The remainder-man's share is secured to him through this agency, and it may happen that the amortisation cannot always be reinvested immediately, and it may not always be possible to invest these small amounts in a safe form at this rate of interest. It is likely, therefore, that this fund will not increase so rapidly as has been assumed in this case. Then the remainder-man when he inherits will find the principal impaired. This scheme, then, though theoretically excellent, is not always practically sound, for a sinking fund is not always trustworthy when exact justice between two parties rests upon its regularity of income.

It is evident that the thing must be worked out on a somewhat different basis. This is easily furnished by the original amortisation schedule given on page 141. We must first recognize that there are two separate sorts of income in a plan of this kind. The first is the bond interest, and the second is the interest on the amortisation. The bond interest is certain, because it is determined by contract, in the terms of the bond itself; but the second element is uncertain, for, as has been stated, it perhaps cannot always be invested at once or at the rate which has been assumed in working out the schedule. The life-man is entitled to the earnings of the original investment, but after the first six months the original investment is not all in the bond, for a part of it has been returned to the trustee, that is, \$820.35. The life-man, consequently, is entitled to 4% on what is left of the bond — that is, 4% on its new book value, — and he is entitled, in addition, to what can be earned by the amortisation fund. In other words, it is not the remainder-man that should suffer from a low present rate of interest on reinvestments (for he is entitled to the original investment), but the life-man. We must then use our amortisation table as given on page 141 and with that as a guide give the life-man 4% on the book value and, in addition, all the earnings of the reinvestment of amortisation. This will work out as follows:



If, now, we compare this plan with the other, we shall find the results identical. The difference between the two tables lies in the fact that here the life-man's share is dependent on the earnings of the amortisation, as it should be — since he is entitled to income only, — and the remainder-man's share is taken from the fixed bond interest, as it should be — since he has nothing to do with the fluctuations of interest earnings but has a right to demand that the premium shall be kept intact for him. If the amortisation fund does not earn the 4% assumed here, this plan puts the loss on the right man — the man entitled to earnings, the life-man, — whereas the other plan put it on the man concerned only with the preservation of capital, the remainder-man. This scheme is perfect.

This is so clearly fair that it seems hardly necessary to dwell on any other plan, but another sometimes resorted to is so obvious and so easy that it has proved decidedly dangerous, — in fact has been upheld in a number of courts where cases of this sort have come before a judge. This divides the total amount of premium, that is, the total shrinkage of principal to be suffered, by the number of interest payments and subtracts the quotient from each interest payment. That is, it distributes the total amortisation equally among the periods that the bond has to run, and gives the life-man the earnings of the amortisation fund. It thus provides for the total shrinkage and leaves the principal intact for the remainder-man; and so far it is good. Unfortunately, however, it does this fairly only in the end and not year by year. If the life-man should die before the expiration of the life of the bond, the principal would be found to be increased, and he would have received less than his due. This will be seen by comparing the life-man's yearly share as given in the last table with his yearly share under the plan proposed. If the total amortisation or premium is divided equally among the half-year periods, the amortisation for each period is \$898.26, and the life-man's share of bond interest is \$4101.74 (\$5000.00 — \$898.26). In the first period this is his total receipt, for no interest has been earned by the amortisation fund. In the second and all subsequent periods the bond interest will be the same, but the income of the amortisation fund will be increasing. Our last table showed the life-man's share to be \$4179.65 in the first period, and, on the as-

sumption that the amortisation fund can earn 4%, for all subsequent periods. In the plan just outlined, on the other hand, we find the life-man's share to be \$4101.74 + \$17.97 (interest on the amortisation fund) in the second period, and so on slowly increasing until in the tenth period it is \$4101.74 + \$161.68 (interest on accumulations of the amortisation fund for nine periods), or \$4263.42 in all.<sup>1</sup> He is thus receiving far too little in the earlier periods and far too much in the later. What he loses in earlier years is made up in the later, to be sure, if he lives; but he is entitled to the income for his life, and if a part of this income is held back, in the expectation that it will be offset later, and he dies, justice is not done. The reason of this failure to do justice is simply that in this case not sufficient allowance has been made to the life-man in early periods for accumulations of the amortisation fund. It is right that each period should give up from bond interest a sum which at the end of the time will amount to one tenth of the premium; but this does not need to be so much in early years as in later, for compound interest must be allowed. To enlarge the fund in early years at his expense is to run the risk that he will not live to receive what has been borrowed from him.<sup>2</sup>

<sup>1</sup> The full table under this plan would be as follows:

Date	Bond Interest	Amortisation	Net Interest	Total Amortisation Fund	Interest on Fund	Total Income of Life-Man	Book Value
1908 Jan. 1	--	--	--	--	--	--	\$208,982.59
July 1	\$5,000.00	\$898.26	\$4,101.74	\$898.26	--	\$4,101.74	208,084.33
1909 Jan. 1	5,000.00	898.26	4,101.74	1,796.52	\$17.97	4,119.71	207,186.07
July 1	5,000.00	898.26	4,101.74	2,694.78	35.93	4,137.67	206,287.81
1910 Jan. 1	5,000.00	898.26	4,101.74	3,593.04	53.89	4,155.63	205,389.55
July 1	5,000.00	898.26	4,101.74	4,491.30	71.86	4,173.60	204,491.29
1911 Jan. 1	5,000.00	898.26	4,101.74	5,389.56	89.83	4,191.57	203,593.03
July 1	5,000.00	898.26	4,101.74	6,287.82	107.79	4,209.53	202,694.77
1912 Jan. 1	5,000.00	898.26	4,101.74	7,186.08	125.76	4,227.50	201,796.51
July 1	5,000.00	898.26	4,101.74	8,084.34	143.72	4,245.46	200,898.25
1913 Jan. 1	5,000.00	898.25	4,101.75	8,982.59	161.68	4,263.43	200,000.00

<sup>2</sup> The total receipts of the life-man under this plan are of course greater than under the other plans discussed, for in this case he receives interest on the postponement of his true share of the income; but he naturally would prefer to receive the principal of his true share rather than to have it withheld and compensated by an interest payment — especially if he is to die and his estate is to lose the interest.

Numerous other complications sometimes arise in connection with allowance for interest and discount, but the principles have been covered in the illustrations given above.<sup>1</sup>

It is to be noted that the principles discussed in this chapter are applicable not only to bonds, but also to leases, royalties, copyrights, dowers, insurance premiums, etc. Wherever time enters into a claim, the valuation is dependent on interest or discount. If, for example, a lease binds a lessee to pay more than the market rate on the property leased, it is a claim to an annuity for the owner of the property; if it binds the owner to less than the market rate, it practically secures an annuity to the lessee.

It is now time to observe the method by which amortisation and accumulation are registered upon books of account. In corporations holding large numbers of bonds it would be obviously a tremendous waste of labor to make a journal entry for each amortisation in each holding of bonds. The amortisation or accumulation for each holding is shown in detail on a special bond ledger, kept as a subordinate ledger represented by an account in the general ledger, and the total amortisation and accumulation are then entered through the journal upon the general ledger. Since amortisation and accumulation are usually identified with interest, the natural entry is in connection with some interest account. Before providing for entries of amortisation and accumulation, therefore, we must see how interest is to be entered.

Good bookkeeping in businesses where interest is a large item requires that three sorts of interest shall be recognized and distinguished, — interest accrued, interest earned, interest due. The distinction between these three classes may be suggested by a concrete case. If you buy, on August 1, a bond bearing interest payable in November and in May, you have on that bond on the day of purchase no interest earned, for you have not earned any interest upon that bond on the day on which it is bought. You have, however, some

<sup>1</sup> An excellent work on this subject is Professor Charles Ezra Sprague's *Accountancy of Investment*. This gives many illustrations of the points covered here, and discusses several complex cases that would be rather out of place in a general treatise of this sort. In connection with Professor Sprague's book are published elaborate interest and bond tables.

Formulæ for the determination of interest, amount, present worth, compound discount, etc., will be found in Appendix F, herein.

interest accrued, for you have bought from the former holder interest accrued between May 1 and August 1. You have, again, no interest due, for your claim is not enforceable until November 1. The purpose of the distinction between these three classes of interest is, then, sufficiently obvious. To Interest Earned is carried only the actual earnings of interest while the investment is in the hands of the business. Interest which lapse of time has made a good claim of the business, though not yet an enforceable claim, is carried to Interest Accrued. Interest on which a claim may be now enforced is entered to Interest Due. Changes in the relation between these three sorts of interest must go into the general ledger and hence entries will be made through the general journal.

Now let us illustrate interest and amortisation in the case given above. On the day of purchase, if we buy above par, we buy three things: a claim to interest accrued since May 1; a claim to the par value of the bond; and a claim to interest payments, from August 1 until the maturity of the bond, at something higher than the market rate (else we should not have paid a premium). The claim for accrued interest will become enforceable November 1; the claim for the par value will be enforceable perhaps in the distant future; the claim for excess interest will be enforceable at regular intervals, and, of course, when each portion is paid the balance remaining will be less, — that is, this claim must be amortised.

Our first entry will be

[1]

Bonds  
Interest Accrued  
To Cash

On November 1, our entries must allow for amortisation, for accrued interest, for earned interest, for due interest, and for the payment of interest if payment is made; thus:

[2]

Interest Accrued  
To Interest Earned

[Interest between August 1 and November 1. Interest accrued was debited for three months' interest when the bond was bought, and it is now debited for that of the second three months. Thus the books show a proper resource.]

[3]

Interest Due  
 To Interest Accrued

[Interest between May 1 and November 1. This transfers the resource from the accrued to the due account.]

[4]

Interest Earned  
 To Amortisation

[To show the amount deducted from bond interest for amortisation of premium.]

[5]

Amortisation  
 To Bonds

[To show the shrinkage in bond value and close out Amortisation.]

Then, if the interest is paid,

[6]

Cash  
 To Interest Due

[This closes the Interest Due, so far as this bond is concerned.]

Finally, if the amortisation is reinvested or set aside,

[7]

Amortisation Fund  
 To Cash

Many variations from these entries are possible. For example, the fourth entry might be omitted by incorporating it in the second, reducing the amount of Interest Earned and adding Amortisation as a credit item; or we could even substitute Bonds for Amortisation in this corrected second entry and thus omit both the fourth and the fifth entry. These entries are kept here because it is desirable to show all the amounts, and since such entries would be made not for each holding of bonds, but in totals for all holdings at regular intervals, the extra labor is not to be considered. Similarly, Interest Due is maintained here in spite of the possibility of combining the third, sixth, and seventh because in case any interest is defaulted this account should show a resource balance.

It will be seen that Interest Accrued is a real account, representing claims, and hence belonging on the balance sheet, and Interest Earned is a nominal account, representing revenue, and hence belonging on the income sheet. Notice must be taken of the fact that

interest has been counted up to the beginning of the new year, and hence the next calculation of interest must be from that time only. In some offices, interest accruments and earnings are figured and entered daily, and amortisation and interest due are entered at all interest dates. Of course these entries are made in totals only, from sheets prepared especially for that purpose.

The treatment of accumulation is slightly different from that of amortisation. Here a part of the interest on the investment is postponed, for since the bond sells at a discount on account of low interest, the deficiency in interest is to be made up only at the maturity of the bond, — when the par value (more than the cost price) will be paid. Theoretically, therefore, the accumulation should be added not only to the book value on the bond account, but also to Interest Accrued and Interest Earned. Only at maturity of the bond does it become Interest Due. The accumulation account, meantime, measures how much of accrued and earned interest is to offset discount on bonds.

In cases of trusteeship with one person entitled to income and another to principal, this accumulation is likely to cause trouble. Strictly speaking, the full income cannot be delivered periodically, for a part is locked up in the bond. It is essential, therefore, that the accumulation shall be exactly recorded, so that delivery may be made at the maturity of the bond. In case of the death of the life-man before maturity of the bond, the accumulation recorded for the time of death belongs properly to his estate — for it is income accumulated during his life, even though the claim be not enforceable until long after his death. The demand sometimes made that this accumulation shall be converted into cash, or shall be redeemed from other funds belonging to the estate, can hardly be maintained with reason if the bequest specifies the property. In such a case, the remainder-man is entitled to that specific property, and it should not be impaired. The life-man is entitled to the income only, and that income can be claimed only as fast as it becomes payable. If, on the other hand, the bequest is in general terms, the life-man may justly complain if the funds are locked up in bonds realizable only after accumulation.



## CHAPTER THIRTEEN

### THE GENERAL PRINCIPLES OF CAPITALIZATION

IN Chapter VII the distinction between charging to revenue and charging to capital was indicated, but the illustrations were of a rather obvious type. Now that our general discussion has proceeded further, it is possible to get illustrations which shall show the various methods of determining the amount of capitalization. As so often before, railroad operations are most likely to serve our purpose, for every one is more or less familiar with their import.

It may be desirable to have the capital accounts represent any one of three points of view. Sometimes it is desired that a business shall be capitalized on the basis of its earning capacity, sometimes on the basis of the cost of duplication, sometimes on the basis of original cost. The main capital account is, of course, Construction, or, as it is commonly called in a railroad report, "Cost of Road." The problem for our purpose, then, is to determine whether certain costs shall be charged to construction or to maintenance. If they are charged to construction, they appear on the balance sheet as a resource at the end of the year. If they are charged to maintenance, they appear on the income sheet among the expenses, and are therefore taken out of revenue. This distinction may be far-reaching; for if they are charged to construction, the expenditure may be used as an argument for increasing capital stock or funded debt. The question is therefore fundamental.

Let us assume that the railroad has a bridge carried away by ice in a spring freshet. It is discovered that if the bridge is replaced the same sort of mishap is likely to occur again. Yet the road can find no better place to put a new bridge than on the old location. To what account should a new bridge be debited? Clearly, this is a case for a maintenance charge, for the property destroyed is replaced by other property of exactly the same value and the expense of replacement is one of the natural costs of conducting business. The only

escape from such a charge would be to divide the cost between several years, upon the assumption that the expenditure would recur perhaps once in four or five years. In that case a part of the cost might be taken out of surplus and the rest out of the profit for the year, — that is, a part would be taken out of accumulated profits shown on the balance sheet and the rest would be included in costs on the income sheet for the year just past. In subsequent years provision should be made, in advance, for expected loss of this sort, allowing, of course, for accumulations of interest. Unless the cost is extraordinary, however, the cost should not be divided among several years, for if the road has suffered in this respect the chance is that in some other particular it has had especially good luck to offset this bad luck. As was indicated in the earlier discussion of depreciation, few years will depart far from the average.

Let us suppose next that the old bridge, which was of wood, is replaced by one of iron. The cost will be very much greater. The new iron bridge will better withstand the pressure of the ice and consequently require replacement less often. Shall it be charged to construction or to maintenance? In this case application may well be made of the truth shown in the third illustration in Chapter VII. Since it is expected that the bridge will be washed away in perhaps ten years, its expected life at the end of the first year is nine years; at the end of the second year, eight; and so on down. It is possible, therefore, to charge to construction the cost of the iron bridge in excess of that of the replaced wooden bridge, taking out of revenue only that part of the cost which is equivalent to the value of the old bridge, and then to "write off" — that is, to charge to revenue — one tenth of the total at the end of each year, so that the cost of the bridge as a whole will ultimately be taken out of maintenance, each year suffering its share. If, on the other hand, it should be thought that the iron bridge will withstand the pressure of the ice so much better than the wooden one that it probably will not be washed away at all, it would be perfectly proper to charge the excess to construction account. The principle of this charge is, of course, that the earnings of the road will be increased by the fact that this heavy item of maintenance is to be escaped in the future, that the road would cost more for duplication, and has actually cost more to the builders. From all three points of view mentioned in the intro-

duction to this chapter, therefore, this charge may properly be made to construction.

Let us now suppose a slight change in conditions. Let us suppose that it is feared that the bridge would be at best in a position too precarious if at the old location, and hence it is to be built a mile farther up the river. The cost of the bridge alone will be exactly as in the case last discussed. The treatment of the track, however, raises new problems. It may chance that to connect the new bridge with the old track by one mile of additional track on each side of the river is cheaper than to move several miles of line. We have, then, two miles of absolutely new track, that is, new construction. Is it chargeable to construction or to maintenance? If we wish our capitalization to represent the cost of the road to the builders, this charge clearly should go to construction. If we wish our capitalization to represent earning capacity, it should be to maintenance, for this additional two miles of track has added nothing to the earning capacity of the road, — indeed, on the contrary, it has probably increased costs, for the haul is longer and more crooked and more line must be kept in repair. The road will earn more in the end, but not more than it was expected to earn before; and since the previous capitalization was based on expected earnings, no change in capitalization is necessary. If, finally, we wish our capitalization to represent cost of duplication, this additional mile may be charged to construction. We are confronted with a dilemma, therefore.

We may get new light if we make our assumption more specific. Let us suppose the road would have been built straight to the new location for the bridge had it been known originally that freshets were likely to occur at the old location. Under these conditions, presumably, this two miles of riverside track is not properly one of the elements of duplication; the building of this extra track has been due to a mistake in the engineer's laying of the road. Duplication would avoid it. It is not, therefore, a legitimate charge to capital as registering cost of duplication. If, on the other hand, capitalization is to represent cost to the builders, and the original builders of the road employed the best engineer that they could secure for a reasonable compensation, they were not to blame for the error; and, therefore, the extra cost, as an element in the sacrifice they have made in constructing the road, may be charged to con-

struction account. Again, therefore, a slight difference in the point of view changes our disposition of the charge.

If, to alter our supposition once more, it chanced that at either end of the new bridge is a range of hills such that the line could not have been built direct to the bridge; but could reach it only by means of this extra two miles of track, this charge for the extra miles can be made to construction whether we wish capitalization to represent the cost of duplication of the road or the cost to the builders of it; for under this supposition the road as it now stands is on the only available route. It still remains true, however, that in the view of construction as capitalized earning power these extra miles must be charged to maintenance, for they have not increased expected earnings or reduced expected costs.

Let us suppose, finally, that the management concludes that rather than build this extra two miles of track with sharp curves leading from the old bridge site to the new, it will tear up two miles of track on each side of the river and relay them direct to the new bridge. Shall this charge for tearing up old tracks and laying new ones be made to construction or to maintenance? In the view of capitalization as representing earning capacity, the charge clearly should be made to maintenance. In the view of capitalization as registering the sacrifice made by the builders, the charge should be made to construction, — for the error was innocent. In the view of capitalization as probable cost of duplication, the charge should be made to maintenance; for the old location would not now be used and the new is merely a substitute for it.

Here, then, we are face to face with a complete contradiction in method, arising from the difference in point of view. When we come to consider the history of railroad accounting in this country, we find methods quite as contradictory. Even though standard roads be chosen for study, it will be found that items which one road charges to maintenance can be almost exactly duplicated by similar items charged on another to construction.

There is, of course, a principle that can determine which account should be charged in any particular case. Let us see what advantages follow from each of the three possible points of view with regard to capitalization. Then we may choose between them and have a working basis for all cases.

Recently a proposition has been prominently made public for abolishing all capitalization as expressed in terms of money. This owes its origin to a recognition of several principles to be set forth below, but it neglects a point most important for the accountant, — namely, that some sort of capitalization is necessary for any scientific bookkeeping. We shall soon see, moreover, that what will serve the purpose is not an abolition of capitalization, but an acceptance of the only basis that can have any real meaning.

First, what purpose is served by seeking to show upon books of account the probable cost of duplicating a commercial or industrial or transportation agency? If the property of a business is to be sold as property, independent of the organization that makes of it an economic unit, such cost is a desirable figure for the buyer (and therefore for the seller) to know. The discussion of municipal ownership of public-service utilities would more often have point if the cost of duplicating the private equipment were exactly known. Here, however, the advantage of this sort of knowledge seems to end. Many demands have been made of late years that the dividends of corporations be limited by law to the equivalent of a "reasonable" percentage on the cost of duplication. If such a demand were to be enforced, accounting to record such cost would be an advantage. We must see, however, that no accounting could record such cost of duplication except by constant changes in the valuation of assets, and such changes could be recorded only by a constant comparison of last valuations with market prices. In other words, the accounting would be devoted very largely to matters having no relation to the business as a *going* concern. It is obvious, too, that all this detailed accounting could serve no real purpose. Why make new valuations on the books every few months in order to determine the legal rate of dividend, when the restriction of dividend, a purely legal matter having no relation to the business as a *going* concern, may as well be determined from figures outside the books? The thing that is of importance for the business is what its equipment actually cost, not what such equipment would have cost under other conditions. If actual costs are recorded, with the date of occurrence, the cost of duplication can always be figured by a comparison of prices paid with current prices; so the argument for keeping cost of duplication on the books entirely disappears. Of the justice of limiting divi-

dends to a "reasonable" percentage not of the actual sacrifices made but of something that never happened, nothing need be said in a book of this sort. It is necessary to note only, as an important accounting principle, that accounts are not worthy of the name if they allow known facts to be hidden and the record ultimately destroyed under guesswork of what might have been.

Second, what is the advantage of capitalizing on the basis of earning capacity? The income sheet, if properly constructed, shows all net earnings. All earnings made should appear here, or else the sheet contains a lie. Of what advantage is it to capitalize the figure of net earnings shown on the income sheet and write up or write down the capital accounts on the balance sheet? The mere school-boy, if you tell him the earnings of a company and the rate of interest, can tell you its capitalized value. In other words, to register on the books a capitalization based on earning capacity is not only to register an unnecessary figure but to bury the actual cost of the assets.

Finally, to capitalize on the basis of cost, or, to express it more exactly, to let capitalization take care of itself under simple straightforward methods, is to preserve a figure which every one wishes to see preserved. The builders desire to know their sacrifice, the buyers desire to know what has been spent, the public thinks it has a right to know whether the dividends bear a proper relation to the actual investment. It is obvious, too, that if this figure be once lost, it can hardly be recovered. Both cost of duplication and capitalization on earning capacity may be readily determined independently of balance-sheet figures; but if construction be confused on the books with maintenance, the actual cost is buried forever.

To summarize, no theoretical accounting aims support any view of capitalization other than cost. Why is it that in practice capitalization is often a purely arbitrary figure of no import? In most cases one of two explanations will hold. Either the managers wish to hide excessive dividends, or they fear that dividends which they deem only fair, or even inadequate, will to the public appear excessive. In other words, public opinion, too weak to enforce justice, is just strong enough to frighten a little both the guilty and the innocent. Public opinion has been singularly obtuse in its consideration of the functions of capital. At some times and places it has neglected to

see that some investors were getting more than they deserved, and at other times and places it has been unwilling that others should get anywhere nearly so much as they deserved. Men who will not risk a cent in any venture which the needs of public service seem to require will complain in bitter terms of the extortion of investors when such a venture brings large profits; and they will sneer at the same investors when some other enterprise fails and the extraordinary gains of the first have been lost. Clearly if the justice of profits is to be determined by actual costs, so that all profits higher than what the public calls "reasonable" are to be confiscated, society must provide, in order to even things, that on all ventures, whether socially necessary or merely whimsical, reasonable profits shall be guaranteed. Does any one think that society can afford to give such a guarantee? If society leaves the adventurer to "take his medicine" after failure, it must leave him more or less free to reap his harvest after success. The temper of many critics of overcapitalization is that of "Heads I win, tails you lose." That there is vast overcapitalization in some corporations, and that overcapitalization is widespread, no one thinks of denying.<sup>1</sup> That it is due in large part to heedless or ignorant criticism of seemingly high dividends is certain. That it is harmful to any one except deceived investors cannot be shown. Remembering that we are concerned here only with the facts as they can be recorded in books of account, let us examine the meaning of this overcapitalization.

This word "capitalization" is used with a wide scope of meaning. Commonly it means the figure of permanent liabilities of a corporation, liabilities that are not intended for early redemption,—practically nothing but capital stock and funded debt, though sometimes including surplus. A holder of funded debt does not normally desire that the bond shall be paid; he has bought it to yield an income, with the expectation that with his money the road will earn something for him. So capital stock and funded debt are the capital

<sup>1</sup> Recent studies of railroad valuations give good evidence that the overcapitalization often complained of is not to be found there. Many roads have charged to maintenance millions of dollars that might have been properly charged to construction and used as a basis for new stock or bonds. The real estate of many roads, moreover, especially at large terminals, has appreciated in value enormously in recent years, but of that fact the accounts have usually taken no cognizance. The striking cases of overcapitalization have been chiefly in industrial enterprises.

liabilities, and comprise in one sense its capitalization. The corporation's permanent assets, on the other hand, — such as, in a railroad, its roadway and real estate, its rolling stock, and its stocks and bonds in other companies, — are sometimes called its capitalization. As a matter of fact, capital assets and capital liabilities, as will be illustrated in the chapter on railroad accounts, are normally about equal. So it matters little which use of the word "capitalization" we adopt. Our question, then, is this, What facts do practical interests require corporation books to show regarding capital assets and capital liabilities?

We have already seen that to try to record cost of duplication as a basis for capitalization is not only laborious but largely unnecessary. We have remaining as practicable bases, then, only earning capacity, and sacrifice, or cost. The former we have shown to be largely adopted by corporations, much condemned by the public, and from the accounting point of view hardly scientific. Let us see the ultimate result of adopting each of these bases in a simple case. We saw in an earlier paragraph that the charge for new track to connect with a new bridge, necessitated by freshets, may be made to construction on the ground that the stockholders of the road are entitled to income on this cost incurred by them, or it may be made to maintenance on the ground that it does not increase earnings. The point of view makes the difference. The former of these plans increases capitalization, the other maintains it. What is the effect on dividends?

Charging to maintenance includes the expenditure among costs, reduces net earnings, and, consequently, reduces dividends. Charging to construction assumes that the expenditure is a full asset, and consequently leaves earnings unaffected. Increasing capitalization, then, appears to give better results to the stockholders. Let us carry the matter through to the end, however. In either case the money has been spent, is gone, is not now available for paying dividends. However great or small earnings may be, this expenditure for track-laying has reduced available assets below what they would have been if the expenditure had not been made. One cannot eat one's cake and have it too. Even though the charge be made to capital, but three possible ways can be found for distributing as much in dividends as could have been distributed if this new track had



not been laid, — issuing and selling new stock, distributing a scrip dividend, and borrowing. Unless some fund within the business is encroached upon, outside funds must be used. These three methods increase capital liabilities to correspond with the increase in capital assets. The first two of these increase the amount of stock outstanding, and hence increase the number of shares among which the dividend is to be distributed. In order to maintain the old amount of dividend, an increase has been made in the number of shares, so that each share shall receive now less than before — just as much less than before as it would have received if the new track had been charged directly to maintenance and had been taken out of profits. If, on the other hand, money was borrowed to make up in dividend for the money put into new track, the interest charges are increased, net earnings are reduced, and the future loses what this year tried to avoid losing. In other words, calling a thing construction rather than maintenance, though it shows greater profits on the books, does not furnish the means to pay greater dividends. The result, in actual tangible things, is quite the same as if maintenance had been charged. The public, then, so far as it considers itself concerned in dividends, has no interest in the question whether the charge is made to maintenance or to construction, that is, whether capital is increased or not. So far, on the other hand, as the public is concerned to know whether the builders of the road are receiving just returns on their investment, it should wish the charge to be made to construction; for if, as in the case assumed (detailed on page 161), the builders committed an innocent engineering error, the books should show that their capital is actually increased and that they have not yet got increased compensation for increased sacrifice. Cost, that is to say, should be the basis of capitalization. Speculators and investors, of course, may prefer that maintenance shall be charged, in order that it may show them that the directors expect the road to earn no more because of this new track; but such information may be given without hiding the valuable figure of actual costs.

The only other method of excessive capitalization is deliberately writing up the assets and issuing stock or bonds to correspond. As has been elsewhere stated, this is usually done at a time of combination or of reorganization. This process, obviously, can have no effect on earnings — and consequently can have none on the amount

of dividends. It results in a smaller percentage of dividend on a larger capitalization. The public is not concerned. Speculators and investors, on the other hand, are often misled, and have a right to object to this method.

The public objection to overcapitalization, then, has no warrant in the notion that dividends are affected. The real warrant lies solely in the fact that the relation between cost and dividends is hidden. Yet, as a matter of fact, overcapitalization as commonly practiced need not hide the relation of cost to dividends worse than other plans that have been proposed to remedy the evil. One does not judge the rightfulness of a man's income until one knows his history, his occupation, his ability, his fortune. No more should one judge the rightfulness of the dividends of a corporation until one knows its history, its assets, its liabilities. It is mere triviality to say that ten, twenty, or even thirty per cent. dividend is necessarily the result of extortion. Five per cent. dividend on one million dollars of stock may be precisely the same thing as twenty-five per cent. dividend on two hundred thousand dollars of stock, and it makes not the slightest difference to anybody which capitalization, with its corresponding dividend, is used. Stock cannot be watered without the water affecting the rate of dividend, and if critics would cease to worry about capitalization and watch actual cash dividends instead, they would have information that would mean something.

This last proposition is deserving of enlargement. If we wish to know the justice of the dividends of a corporation, what do we need to know? Three things: what the investors have put in; what risks they have taken; what they have taken out. Nothing else can be of any importance in settling our question. The first of these can be readily learned if the books are properly kept, and published reports should show it, — not necessarily repeated every year, though that is desirable, but reported whenever a change occurs. Then the history of the corporation can be known. In the argument of a few pages back, insistence was laid on the accounting value of having separate costs carefully recorded. For the purpose of our argument here, however, that is not necessary. All that concerns the critic of dividends is, in this particular, total investment by stockholders. The cost-of-road account may be written up and the stock may be watered to any degree, without misleading any one if the actual in-

vestment of the stockholders be known. Next, obviously, no one can fairly judge of any rate unless he understands the risk involved. Finally, we must know what has been taken out by stockholders, not in terms of percentage of nominal capital stock, but in absolute amount, so that we may compare it with actual investment. Do we need to know the stock dividends? As has been already suggested, stock dividends do not provide funds. Of what avail is any stock if no dividends are paid on it? Until cash dividends are paid on watered stock, the water is of no value to any one except for speculative purposes; and when that dividend is paid, the total amount of cash dividends must go up. Then something has been taken out by stockholders, and the figure is worth watching. So, in the last analysis, the only concern of the public is the relation between investment and cash dividends taken out. Percentages of capital stock have no meaning.

This is worth an illustration. Suppose a corporation is organized with capital stock nominally of \$1,000,000, with \$200,000 paid in, — the rest being offset by exaggeration of assets. If the corporation earns \$50,000, and pays 5%, the dividend is 25% on the actual investment. If in the next year the earnings are \$100,000, and \$50,000 for dividends is paid in cash, the rest of the earnings, \$50,000, may be issued as stock dividend. Next year the earnings may be \$150,000, with \$50,000 paid in cash (a lower rate on the outstanding stock but still 25% on actual investment) and \$100,000 added in stock dividend. The capital stock will stand now at \$1,150,000; of which \$800,000 is water, \$200,000 is original investment, and \$150,000 is profits remaining in the business. So long as only \$50,000 is paid in cash dividend, the stockholders are getting *out* of the business only 25% upon their investment. Let us suppose that now more capital is actually invested by the stockholders, say another \$200,000 paid for \$1,000,000 in stock. The capital stock is now \$2,150,000; \$400,000 invested, \$1,600,000 water, \$150,000 profits. If earnings now become \$322,500, 15% on the nominal capital, and are distributed in full, the situation may be summarized briefly as follows: in addition to the nominal rate on the actual investment, 5% dividend was paid for three years on \$800,000 water, and the last year 15% was paid on \$1,600,000 water and on \$150,000 profit accumulated above the amount distributed in the first two years. We can

thus figure the excess above the nominal rate, giving an actual rate of 38.9%. Yet the person who knows nothing of the water or of the stock dividend can get practically as much information as we provided he is able to get figures showing the actual investment and the actual cash dividends; for these (dividing the latter by the former) give an average rate of 38.9% a year, the same figure we got by the detailed method. So water and reinvestments do not really interest him; for they affect the total dividends if they avail anything, and they are unobjectionable if they avail nothing. Our sole concern is to know whether 38.9% is too much in this particular case. Suppose it be assumed that 20% on the actual investment is enough for a business of this sort. (Of course the argument for limiting corporation profits is based almost wholly on the legal fact that corporations are given by society special privileges which distinguish them from partnerships, and hence society has a right to control them.) We know, then, that the dividend is excessive by an average of 18.9%;<sup>1</sup> and we have got this figure with no other information than the actual investment and the cash dividends. We have needed to know nothing about overcapitalization, or water, or profits, or stock dividends.

We have seen, then, that the popular criticisms of overcapitalization are to great extent based on misconceptions; for overcapitalization has no part in increasing earnings, and it can hide the justice of dividends only when original investment is falsely stated. Overcapitalization does deceive in practice, however, because few read reports intelligently; and no doubt it will be employed until the public comes to have a more enlightened view of the compensation due for risks in various kinds of enterprise. It is true, nevertheless, that in every point of view except that of the man who thinks he must misrepresent costs in order to secure merely fair compensation for risks, capitalization at actual cost is the desideratum; for, as it has been the purpose of this chapter to show, the figure of cost is

<sup>1</sup> If objection is made on the ground that stockholders are entitled to dividends on profits left in the business, the answer is that such dividends are justified only on profits not excessive. The actual cash dividend, which includes earnings on profits reinvested, is the only measure of benefit to stockholders; and if 20% was enough, the extra 18.9%, in part paid on profits reinvested, was earned by profits originally excessive and consequently never properly belonging to the stockholders to invest.

most serviceable for the manager, for the economist, for the investor, and for the determination of justice in prices and rates.

A corollary of these principles is sometimes strikingly neglected. While public opinion is complaining of overcapitalization, a considerable body of it is also complaining of undercapitalization — not realizing the contradictory attitude. It is commonly said, for instance, that many railroads are charging to maintenance what they should charge to construction, — thus understating profits and accumulating what are sometimes called “secret reserves.” Obviously what is said is true. To charge to maintenance new construction and other improvements that will increase earnings is to reduce apparent profits and to hide valuable assets. If these assets were properly recorded, the figure of surplus, or reserve, would be increased; and hence the reserve is actual, but secret. The reason given for this practice is that such roads prefer to maintain large margins of safety for poor years, rather than to distribute extra earnings to stockholders. It is recognized, then, that by the amount of these secret reserves earnings are larger than they are reported. Is the public concerned? So long as these resources are kept in the railroad — that is, are spent in improving the line and the equipment, — who gets the benefit? Surely not the stockholders, until cash dividends are distributed from these new earnings. The public, on the other hand, is getting better and better service from the disposition of these secret reserves, and it can hardly complain with good cause. Even if earnings, including the hidden part, are too high, there should be no complaint if the excess goes back into the road. Only when the stockholders plan to take out of the road, in increased cash dividends, these earnings that some people think excessive, can the public even pretend that it is exploited. Usually, of course, the complaint is accompanied by a demand for lower rates. The question is simply whether the people prefer better railroads or lower rates. If the power of distribution of dividend is practically without check, the public is naturally eager to see that these improvements, made from earnings paid by the public, be not allowed to swell dividends thought to be already large enough. The criterion here, then, as in the other cases, is simply cash dividends, independent of capitalization. On accounting principles, the cost-of-road account should include these construction items, and the surplus

should show that they have been provided for out of net earnings. Then a judgment of what is a fair dividend could be made with full wisdom on the part of all concerned. Then, too, a distribution of unexpected dividend out of secret reserves would be no longer possible for stock manipulators.

In general, there can be no question about the legality of determining capitalization on the basis of earning capacity. When one faces the task of issuing new bonds and stock on such expected earnings, however, one must study carefully the law of the State concerned. Some States now forbid stock-watering in any form. Some States require good cause to be shown for such increase in capital liabilities.

To summarize this chapter in a few words: the purposes of accounting are served best by charging to capital only actual costs (whether original investment or reinvested profits); and neither overcapitalization nor undercapitalization is a matter of concern to any one if only actual costs are known and are compared with cash dividends; but the determination of a reasonable dividend is quite as dependent upon a knowledge of risks taken as upon a knowledge of the amount of actual investment.

## CHAPTER FOURTEEN

### SOME GENERAL PRINCIPLES ILLUSTRATED IN RAILROAD ACCOUNTING

A RAILROAD report is divided into three parts, as follows: first, the balance sheet, or general account, as it is sometimes called; second, the income sheet, or income account; third, the traffic report, or statistics. These three parts are really but one body and should hang together. The art of interpreting such a report lies largely in the ability to correlate the parts and see whether they are consistent. As a preparation for some practice of that sort, it is well to notice the form of the first two of these three parts of a report, — the form of the last is a matter largely of indifference.

Every balance sheet contains at least two parts for both debit and credit, though in reality most roads show the balance sheet as if all items were in the same class. Each year, however, a greater number of roads are adopting the plan of dividing the sheet. The first of these divisions we may call the capital part, containing all capital items, — that is, all items that are permanent; and the second we may call the current part.

On the credit or liability side of the sheet, these capital items are always at least two in number, namely, capital stock and funded debt. The first of these is obviously permanent, for capital stock is not a debt to be paid but only a liability to be accounted for, and it must endure as long as the corporation endures. Funded debt, too, though ostensibly of a more or less temporary sort, always in practice is permanent, for few railroads or other corporations intend ever to pay off their bonds and few bondholders care for the payment of the debt if only they can get their interest. Men ordinarily buy bonds for investment, and permanence in any investment is one of the valuable features. If the bonds must be paid, usually a road issues new bonds to pay for the old or exchanges the old for a new issue; so the debt itself is none the less permanent.

The first capital item on the debit side of the balance sheet is

usually the "Cost-of-Road Account," though it may sometimes bear other titles, such as "Construction and Equipment," "Franchises and Property," "Cost of Road and Equipment." That is to say, sometimes equipment is reported as separate from the road-bed and real estate, and sometimes it is included with them. A little observation of the balance sheet should always show what this item is meant to cover. The next capital item on the balance sheet is usually the corporation's ownership of stocks and bonds of other companies, which may be reported as one item or as several; commonly the item or group of items is called "Investments."

Capital assets and capital liabilities are likely, for very obvious reasons, to come somewhere near a balance. The purpose of issuing stock and borrowing money is to construct and equip the road or to secure control of other roads; so in the nature of the case a road should be able to show in its permanent assets a value practically equivalent to its own stocks and bonds issued. The correspondence need not be exact, however, for a road needs a certain amount of what is known as "working capital," such as stores, cash, etc., and unless it has accumulated a surplus it cannot lock up all its capital in permanent form. A report is better than it otherwise would be if it presents this relation between capital assets and capital liabilities so that they can be compared at a glance, distinguishing them from the other figures of the balance sheet; and, therefore, if the sheet is carefully made up, a total of this first portion of the sheet will be given before the other items are added.

In the second, or current, portion of the balance sheet should be included on the debit side all items that can be readily converted into cash, and on the credit side all sums which the road may be called upon soon to pay. A comparison of the current assets with the current liabilities shows the immediate standing of the road, that is, whether it is likely to be able or unable to meet its immediate debts. For this reason a report that shows the current assets and current liabilities so that they can be compared at a glance is better than one that does not do so; and, therefore, the total of this portion of the sheet should be indicated. Current assets should exceed current liabilities, for any business with immediate resources of no more than its immediate liabilities is in a doubtful position.

Profit and Loss, or Surplus, is not exactly a capital account in the



ordinary sense, for the amount was never invested; and yet it is not exactly a current account, for it need not be paid out. Any surplus which a road has accumulated from its profits must exist somewhere in either the capital or the current assets, possibly in both; and the nominal account representing or explaining that surplus is a liability, for it represents a responsibility of the road to the stockholders, and this liability grows as the road gets richer. Since it is neither capital nor current, it should properly stand as an item entirely by itself on the credit or liability side. Then the report shows plainly the fact that the assets exceed the corresponding liabilities and the excess measures the surplus. The same sort of thing, of course, is true of reserve funds and of any other funds set aside for a particular purpose from accumulated profits.

Some roads add still other classes to their division of the balance sheet. One class desirable to show is accrued liabilities and resources, — to include items not yet due but already earned or incurred, such as rentals, taxes, and interest. If interest or rent is due semiannually on April 1 and October 1 and the fiscal year of the road ends June 30, when the road figures its profits for the year it must count as a cost the interest accrued for the last three months though not due for three months more. To give an exact statement of the condition of a corporation, moreover, one must make allowance for interest even on items bearing no interest. For example, if the corporation has issued, on December 30, notes due in two months without interest, those notes are a less serious liability than they would be if due to-day; for either the corporation can lend the money in the mean time or it escapes the need of borrowing. Similarly, a bill receivable due in two months is a less valuable asset than one due to-day. If the balance sheet is to be an exact statement of the business as it stands on December 31, therefore, allowance should be made on it for such items. On the books, these items would be treated similarly to accrued items as illustrated in Chapter V, page 47, or in Appendix B, II; a debit allowance entered at the close of this year would, when brought down to the new year, stand as a credit, and would thus exonerate next year's interest account for loss suffered by this year's escape from interest. Even if next year suffers no direct payments on this score, it will at least fail to receive what it should receive as an inheritance from this year, and it should

be credited with what this year has taken from it, — namely, the use of money which next year should inherit at once. Since such resources and liabilities — accrued and allowed interest, accrued and prepaid rentals, accrued taxes, etc. — belong in neither the capital nor the current classes, they may well form a class by themselves.

Some roads also report a class of contingent assets and liabilities, to include items which are not yet definitely decided but may go for or against the road and should, therefore, show somewhere in a statement of its standing. Such contingencies are bonds of subsidiary roads guaranteed by the controlling road and protected, of course, by liens on the controlled roads. Surely, if a \$10,000,000 road has guaranteed \$5,000,000 of bonds of other roads, this fact, with the security held for the guarantee, should be shown. If a road includes contingent items on its regular balance sheet, as some roads do, one who is to judge the condition of the road must allow for the fact that these are contingent and may not turn out as the sheet indicates the expectation to be. To include doubtful items with certain items is to cast a corresponding doubt over the totals of the whole sheet. It seems very much wiser, accordingly, to keep these contingent items out of the main body of the balance sheet and include them in a supplementary statement. One road, a few years ago, had on its balance sheet an item of nearly \$8,000,000 of contingent assets with no contingent liabilities, and treated these assets like any others, while it recorded a surplus of \$12,000,000. It was evident to any one who knew the nature of the contingent assets that this surplus might with the occurrence of the contingency shrink to \$4,000,000. This well illustrates the desirability of keeping such items out of the main sheet.<sup>1</sup>

A desirable form for a balance sheet is given on the next page.

<sup>1</sup> It is common to carry doubtful items of bills receivable and accounts receivable to an account called "Suspense." The name sufficiently suggests that, though hope has not been abandoned concerning them, they belong rather among the contingent than the current assets. Other accounts with the name "suspense," but of an entirely different nature, are sometimes found useful. These are mere temporary catch-alls, used to receive items of which the ultimate disposition is not yet known. For example, on a railroad all charges for a construction train might be carried for three months to Construction Suspense, and at the end of the time the items might be analyzed and then allocated to the various accounts for construction and for maintenance. Such accounts are not usually contingent, but are likely to relate to revenue, though they may be also for resources.

<i>Capital Assets</i>					
Cost of Road	\$125,000,000.00		Capital Stock	\$55,000,000.00	
Stocks and Bonds	48,000,000.00		Funded Debt	111,000,000.00	
Sinking Fund	4,000,000.00		Sinking Fund Require- ments	4,000,000.00	\$170,000,000.00
		\$177,000,000.00	<i>Current Liabilities</i>		
<i>Available Assets</i>			Bills Payable	2,000,000.00	
Accounts Receivable	8,000,000.00		Accounts Payable	2,000,000.00	
Due from other roads	3,000,000.00		Due other roads	2,000,000.00	
Supplies <sup>1</sup>	3,000,000.00		Claims audited	1,000,000.00	7,000,000.00
Cash	3,000,000.00	17,000,000.00	<i>Accrued Liabilities</i>		
<i>Accrued Assets</i>			Rentals	2,000,000.00	
Interest	1,000,000.00	1,000,000.00	Interest	2,000,000.00	4,000,000.00
			<i>Profit and Loss</i>		14,000,000.00
					<u>\$195,000,000.00</u>
					<u>\$195,000,000.00</u>
<i>Contingent Assets</i>			<i>Contingent Liabilities</i>		
Suspense Account	\$1,000,000.00		Guaranteed bonds of subsidiary roads		\$7,000,000.00

<sup>1</sup> Some roads include supplies among the capital assets, doubtless on the double ground that at least a minimum of supplies is as much a necessity of operation as rails and cars, and that supplies are not really available for paying debts.

We may now turn to the income sheet. The most satisfactory form is that used by the Interstate Commerce Commission, illustrated as follows:

	Gross earnings	\$105,000,000.00
	Operating expenses	70,000,000.00
(difference)	Net earnings	35,000,000.00
	-Other income	10,000,000.00
(sum)	Gross income	45,000,000.00
	Fixed (and other) charges [interest, taxes, etc.]	20,000,000.00
(difference)	Net income (available for dividend)	25,000,000.00
	Dividend	20,000,000.00
(difference)	Surplus for the year	\$5,000,000.00

The term "gross earnings" is usually assigned to sums received for services rendered, as for passengers, freight, mail, express, baggage, storage, elevators, stock yards, telegraph, etc., just as we speak of a man's earnings as his wages, salary, or royalty, distinguished from interest and dividends on his property. Some roads, however, include in earnings dividends on any stock and interest on any bonds that they may own in subsidiary roads. This is confusing, but is usually done only when the items are comparatively insignificant. The "operating expenses" or "expenses of operation" mean practically always the same thing, that is, the expenses incurred in obtaining the gross earnings. That is to say, earnings and operating expenses relate to the same thing, are really effect and cause. A very common method of comparison of one road with another is to express the relation between gross earnings and operating expenses in terms of a percentage, as to say that one road is operated for 65% and the other for 70%. This fact indicates that it is objectionable for any road to include dividends and interest in its earnings when other roads do not do so.

The significance of net earnings, which is simply a balance, differs between different roads as that of their gross earnings varies. "Other income" includes usually receipts from investments, land sales, etc. "Gross income," being a mere sum, varies in use only as do the items of which it is the sum. What most roads call "fixed charges" are sometimes called "first charges," and the expression should always mean items which are beyond the control of the management, such as taxes, interest on bonds, and other matters independent of opera-

tion. After fixed charges have been subtracted from gross income the result is the amount which the company, if the accounts are properly kept, has earned for the period under consideration. This amount is, of course, available for dividend; and any amount not so used becomes surplus for the year, — which, when added to the accumulated surplus of past years, appears upon the balance sheet in the new figure of surplus.

This form is coming to more and more general adoption among the railroads of the country, but many roads still adhere to forms which are more or less peculiar. To each of these peculiar forms, except so far as they enlarge the other form, some objection may be made. Perhaps the worst of these is as follows:

	Gross earnings
	<u>Operating expenses and taxes</u>
(difference)	Net earnings
	<u>Other income</u>
(sum)	Net income
	<u>Interest, rent, and dividends</u>
(difference)	Surplus for the year

This is decidedly objectionable, for it mingles things of unlike nature. For example, though taxes are independent of management they are here coupled with operating expenses, and by so much the facts are hidden, — both the effect of any change in taxes and that of good or bad economy in the management of the road. Again, in this statement net income is not net, for not all the costs have been subtracted. Interest and rents are as much costs of running the road as are operating expenses, and the income is not net until they have been subtracted; though, since they, with taxes, are of a different sort from operating expenses, they should be distinguished from them. Finally, dividends, which are purely voluntary, are not in the class with interest and rentals, — for the latter are fixed. In the form of income sheet just given there is no indication of a comparison between the amount available for dividends and the dividends actually declared.

Though the form used by the Interstate Commerce Commission is not always available in the printed income sheet of particular roads, usually it can be obtained by combining or transposing the figures

given by the roads in their own reports; and when we have to compare two roads it is always desirable to arrange the figures on the same basis so that the comparison may be just. Clearly, to take net income for one road as reported in the Interstate Commerce Commission form and net income for another as reported in the form given last, and to draw comparisons between the two roads on that basis, would be almost as unreliable as mere guesswork. No one should use figures from an income sheet until he knows exactly what they signify.

Perhaps the best way to illustrate the study of a railroad report and to show the relation between its three parts — namely, the balance sheet, the income sheet, and the statistics — is to take a specific case of railroad history and see how far the condition ultimately resulting could have been foreseen from the reports of a few years earlier. For this purpose, of course, it is desirable to take a closed incident. One of the best illustrations is the history of the Atchison, Topeka & Santa Fé Railroad between its reorganization in 1889 and its bankruptcy in 1893.

From the reports of the road for that period we can obtain figures as follows:

	Cost of Road (millions)	Investments (millions)	Capital Stock (millions)	Funded Debt (millions)
'90	\$81.0	\$212.4	\$90.9	\$218.8
'91	86.6	219.0	99.5	220.8
'92	91.3	225.6	99.9	223.3
'93	96.0	230.4	101.8	228.1

	Accounts and Bills Receivable (millions)	Accounts and Bills Payable (millions)	Advances to Sub- sidiary Companies (millions)	Cash (millions)	Surplus (millions)
'90	\$5.0	\$2.8	\$5.0	\$6.3	\$0.7
'91	7.2	8.9	6.1	4.0	2.3
'92	6.1	10.8	7.7	4.5	4.5
'93	9.4	12.4	8.3	4.2	7.7

	Gross Earnings (millions)	Gross Earnings per mile	Operating Expenses (millions)	Net Earnings (millions)	Net Earnings per mile
'90	\$31.0	\$4,335	\$20.9	\$10.1	\$1,472
'91	33.6	4,733	24.0	9.6	1,353
'92	36.4	5,114	25.2	11.2	1,576
'93	41.3	5,523	28.6	12.7	1,699

	Revenue Trains				Operating Ratio
	Miles (millions)	Earnings per mile	Operating Expenses per mile	Net Earnings per mile	
'90	22.3	\$1.39	\$0.94	\$0.45	68 %
'91	25.2	1.33	0.95	0.38	71 %
'92	26.3	1.38	0.96	0.42	70 %
'93	29.5	1.40	0.97	0.43	69 %

	Maintenance of Way, per mile	Maintenance of Equipment per Mile Run		
		Locomotives	Passenger Cars	Freight Cars
'90	\$633	\$0.043	\$0.0059	\$0.0043
'91	717	0.050	0.0071	0.0047
'92	645	0.055	0.0097	0.0055
'93	741	0.052	0.0090	0.0059

	Average Mileage of Freight Cars	Number of Freight Cars	Average Locomotive Mileage	Average Train Load
'90	11,402	23,013	32,550	121 Tons
'91	10,242	27,914	34,294	112 "
'92	10,200	30,803	36,112	119 "
'93	10,135	32,626	36,110	122 "

	Income from Investments (millions)	Interest (millions)	Net Income (millions)
'90	1	1	1
'91	\$0.5	\$5.5	\$1.5
'92	0.5	6.0	2.0
'93	0.5	8.7	1.9

Not all these figures were published by the road itself, unfortunately. Many of them we can get only by combining other figures published. For example, the road does not publish its average freight-car mileage. This we obtain by dividing total freight-car miles by the number of freight cars reported in the equipment. This may not give absolutely accurate results, for foreign cars and Atchison cars on foreign lines should be considered; but since our purpose is chiefly to compare years, the method is fair. The average train-load is not given: this we get by dividing tons carried one mile by the number of freight-train miles. Cost of maintenance per mile run is given only for locomotives: the other figures are obtained by dividing the debits to several accounts under the operating expenses by the number of each kind of equipment. The difficulty of obtain-

<sup>1</sup> Reported for nine months only.

ing correct figures is increased by the fact that the road reports some items for the consolidated system and others for the Atchison system proper.

It is desirable to begin our examination with income. We find gross earnings increasing satisfactorily. The total increase is of no importance, however, unless it bears a correct relation to the mileage of the road; for a road adding new mileage without adequate increase in traffic is weakened. We next find our gross earnings per mile to be also increasing steadily.

We turn next to operating expenses. These in 1891 had increased much faster than earnings. This increase was explained in the text of the report as due to increased traffic expenses, and to heavy maintenance charges consequent upon the overburdening of rolling stock of the year before. These explanations are not convincing. Let us examine them in detail. Though heavy traffic would increase operating expenses, it should not increase them in greater measure than that of the increase of traffic. We find, however, that though earnings had increased a little over 8%, and ton miles only 4½% (1,769,000 tons to 1,844,000 tons), the cost of labor for transportation has increased 24% (\$4,300,000 to \$5,400,000), the cost of fuel has increased 15% (\$2,400,000 to \$2,800,000), and the expense of foreign agencies has increased 53% (\$294,000 to \$449,000). The increase in the cost of labor might have been due to an increase in the rate of wages, but no evidence of this appears. We find, on the other hand, evidence of poor economy in management in the fact that the average train-load, very light even in 1890, falls 7½% in 1891. The company attempts to explain this by the extraordinary demands upon the rolling stock, but it does not explain how lighter loads increase efficiency. Though locomotives were driven farther, freight cars traveled a shorter average distance. The greater cost of fuel cannot be due to a higher price, for the price paid for coal is given in the report as 2% lower in '91 than in '90, and wood as only 1½% higher — insignificant in comparison with an increase of 15% in fuel cost. Maintenance of equipment, though costlier than in 1890, was below what it became in subsequent years and far below what it should have been. In other words, the attempt to explain away the increase of operating expenses over the increase in receipts for 1891 merely emphasizes the poor economy of the management. This is



confirmed by the statistics for revenue trains. Though gross earnings of the road increased, the earnings per train mile decreased — showing excessive running of trains for the traffic. Operating expenses per train mile, moreover, actually increased. So a double loss was suffered in train operation. There should have been a gain; for the rates for transportation, as shown by the report, had risen (the average passenger fare per mile rose from 2.234 cents to 2.357, and the average freight charge per ton mile rose from 1.228 cents to 1.265).

Taking our four years as a whole, however, we find a fairly steady growth of gross earnings, net earnings, and net earnings per mile.

Our next problem is to determine whether the earnings are real. The first inquiry is about the adequacy of maintenance charges. The maintenance of way charge, varying from \$633 to \$735, is very low. The Atchison road is favored by its location, and of course it has a single track line; but it is hard to believe that the road could be kept in good condition at the cost shown here. Rails cannot ordinarily be counted upon to last more than twenty years; a road should therefore relay about one twentieth of its line (or more) each year. The Atchison took three years to relay one twentieth ('91, 152 miles; '92, 93 miles; '93, 118 miles). The Southern Pacific, in the same years that the Atchison was spending an average of \$684 per mile for maintenance, was spending an average of \$1083, and it was not then as now accumulating a large reserve of betterments. The average for the Northern Pacific, the Southern Pacific, and the Union Pacific, combined, was for these years \$982. The figures for maintenance of equipment are also extremely low. The average American maintenance for locomotives is about seven cents per mile run; for passenger cars, one cent; for freight cars, six mills. The figures for the Atchison show locomotive maintenance wholly inadequate, and car maintenance adequate only in the last two of the four years. Does this explain why the loads were light and expense of hauling heavy in 1891?

Before proceeding with the other items of income we had best investigate the balance sheet, to see whether any assets should have been charged against revenue. Cost of Road shows a steady increase, of practically five million dollars a year. This is not mainly for new mileage, for the average mileage figures given in the report run as follows: 7111, 7112, 7124, 7480. These figures of mileage are con-

fusing. In the report for 1892 the mileage is given as 7124; but in that for 1893 it is given as 7480, "an increase of six miles over 1892." That is to say, the Colorado Midland is omitted from the figures for 1892 in the 1892 report, but is included in the figures for 1892 in the 1893 report. Such discrepancies make a great deal of extra labor for any one studying the figures, for they are not explained. The only considerable increase in mileage to account for the increase in Cost of Road is in 1893, but only six miles of this belongs to the Atchison, for the Colorado Midland, the other 350 miles, is represented among the assets by its stock held and is not consolidated with the Atchison mileage except for operating purposes. We have, then, to explain about five million dollars annual increase in cost of road practically without increase of mileage. The report shows charges to construction and equipment for improvements and increases as follows (in millions): 2.7, 3.5, 2.2. How shall we find the rest of the annual five million? We should like to put that question to the accounting officers of the road. No trace of it appears. There is, on the other hand, what looks like an attempt to hide the fact that there is a discrepancy. Each year's balance sheet begins with an item of "Franchises and Property," and adds to it the "Property Additions during the Year"; then the total is carried out as the first main item of the balance sheet. The "Property Additions" correspond practically with a detailed table of "Amounts charged to Construction, Improvement, and Equipment." This should mean that the initial item is brought over from the last year and the new items are added. When we test this, however, we find that the initial item each year is much larger than the final item of the year before. To illustrate, in 1890 the initial figure for property was \$80,105,002, to which addition was made of \$930,014, giving a final item of \$81,035,016. In 1891, however, the initial figure was \$83,912,568, to which addition was made of \$2,748,952, giving a final total of \$86,661,520. So far as any one can see, all proper charges to cost of road and equipment are included in the item of two and three quarters millions added to the eighty-four millions. But whence came that eighty-four millions? The final item of the year before was only eighty-one millions, and no possible reason for increasing it except new construction already accounted for in the two and three quarters millions is apparent. Only when one compares the balance sheets of two years, with an

attempt to account for changes, does this discrepancy appear. What does it mean?

The item of investments should be examined next. The Atchison does not show its valuation of investments in detail, but gives the par value of each holding and shows the ledger valuation of the total holdings. The increase in the first year, as shown by detailed tables, is practically the same as the increase in holdings of St. Louis & San Francisco stock at par. This does not necessarily indicate that the St. Louis & San Francisco stock has been valued at par, of course, for other stocks may have risen in value during the period; but one or the other of these things must have happened. Let us examine this matter. The chief holding, in the class of investment showing an increase, besides the St. Louis & San Francisco, is stock in the Atlantic & Pacific Railroad. For the year, the St. Louis & San Francisco showed an actual deficit of expenses over earnings ( $\frac{1}{5}$  of 1%), and the Atlantic & Pacific showed a deficit of almost 3%. It seems a little peculiar either to value the stock of the former at par or to increase the valuation of the latter above its value a year before when each had earned so trifling a sum. There is a consideration, however, on which the stock in a non-paying road may be very valuable to a controlling road. If the subsidiary road is a feeder, and brings to the controlling road much traffic on which the latter earns for long hauls, the gain on the extra through traffic may more than offset the loss of dividend on the stock. So the holding of stock which gives control may be worth par to the controlling company. One other consideration, moreover, is necessary. The controlling road of course divides the rate on through traffic between the two roads. If this rate is divided arbitrarily, rather than scientifically, the auxiliary road may appear to be run at a loss when in reality a just division of rates would give it a part of the earnings of the controlling road. Indeed, so far as the controlling road owns less than all the stock of the other, it will find profit in an unfair division of the rate; for all that it takes unfairly goes into its own coffers, whereas what it allows to the other must be divided with other stockholders. We cannot be sure, therefore, what is the exact meaning of this increase in investment holdings on the balance sheet for 1891.

The next year sees a similar transaction with stock of the Colorado Midland, which was rapidly accumulating a deficit (3% for 1892).

The report for the next year gives a repetition with more stock of the St. Louis & San Francisco, which is now nominally earning one per cent. but still facing a growing deficit because of unprofitable relations with other roads. To summarize these investments of the Atchison, then, we conclude that they are distinctly worth less than the balance sheet figures unless the control connected with them is of great value. This seems very improbable, however, for we find that even the Atchison's own figures give, with the help of these feeders, a net income of only two per cent.

We have found a total increase of capital assets on the balance sheet of thirty-three millions, fifteen millions in Cost of Road and eighteen millions in Investments. Twenty-one millions of this increase in assets has been secured by funds raised by increasing Funded Debt and Capital Stock. We have twelve millions still to account for. The increase in Accounts and Bills Payable provides for nine and a half millions, and the decrease in cash for the remainder. Two items of assets remain, and we find their increase exactly equivalent to the surplus. In proportion as this increase is good, then, the surplus will be good. Accounts and Bills Receivable have nearly doubled in three years. But have they not increased too fast? In 1893, gross earnings increased but 13%: this item has increased 54%. Would such a road willingly allow nearly ten millions to be tied up in such accounts, — the equivalent of one tenth of its Cost of Road?

The advances to subsidiary roads raise a new problem. These advances are chiefly (\$7,800,000 out of \$8,300,000) to the Atlantic & Pacific Railroad and the St. Louis, Kansas City & Colorado Railroad. What is the probability of repayment? The Atlantic & Pacific, as already stated, was accumulating a deficit. This in 1893 was 16% of its capital stock (\$12,502,432 deficit on a capital stock of \$79,760,300). The other road had accumulated a deficit of 74% of its capital stock (\$1,187,370 deficit on \$1,600,000 capital stock). To count such advances as good is to take a very hopeful view of the future. Here are sums larger than the whole Atchison surplus, and no prospect appears that they will ever be worth anything. It may be true that the advances to these roads gave good earnings to the Atchison, by stimulating joint traffic, or it may be true that the Atchison through its division of the rate prevented these roads from

earning anything. In such a case the advances would be justified as good business policy; but how should they be recorded on the books? Not surely as assets, but as costs of getting business. They should be included in expenses on the income sheet, and there be taken out of profits. They have no relation properly with assets. We must, therefore, at a sweep, if we are to show Atchison affairs as they were, write off this item and with it the surplus. Indeed, this, with a reasonable degradation of Accounts and Bills Receivable, would produce a considerable deficit.

Of the remaining items not much needs to be said. The income from investments, as we may well suspect, is ridiculously small, — less than one quarter of one per cent. The charge to interest is dependent chiefly on the funded debt, of course. Here it increases more rapidly because under the reorganization of 1889 interest payments were to increase with earnings until a certain maximum rate should be attained. The net income is simply a balance; but now that we have seen that advances to other companies was wrongly counted as an asset, we should write down this net income to the following figures: 1891, \$400,000; 1892, \$400,000; 1893, \$1,300,000. The failure of surplus to follow net income (no dividends were paid) is due to the inclusion of the operations of subsidiary lines in operating figures, but not, of course, in figures for the balance sheet.

Our summary of the situation, then, is discouraging. Earnings are steadily increasing, but practically every other element is doubtful or distinctly unfavorable.

Let us look for a moment at the road's solvency. In the first year, current assets were eleven and a third million dollars against eight million current and accrued liabilities, of which more than five million was for interest and taxes. In 1891, the relation between these was reversed: eleven million to fourteen million. At this time the road reported as among current assets in addition to the figure given above over six million of treasury securities "available for payment of current obligations." To use these for such purpose, of course, would be to convert current liabilities into capital liabilities; and therefore in a sense the arrangement of the balance sheet is misleading. For 1892, the relation was eleven million to sixteen and a half million, with seven million in treasury obligations available to add to the eleven if necessary. For 1893, we find thirteen and a half against

sixteen and three quarters, with seven million and a half available treasury obligations. In other words, only by considering treasury bonds and notes as current assets could the road show after 1890 current funds to guarantee payment of its current liabilities.

It is now interesting to see what was the opinion in financial centres concerning the condition of the Atchison. On December 9, 1893, the "Commercial and Financial Chronicle," the best-known financial paper in the country, said that the last annual report of the Atchison showed current assets of a million and a half more than current liabilities, and that the earnings to October 1 were enough to pay the three months' proportion of the charges and leave a good surplus. "Statistical analysis gives no warrant for unfavorable rumors," it said.

Just two weeks later the Atchison asked for the appointment of a receiver, on the ground that the road could not meet its approaching January interest. One explanation was that the season was unfavorable for selling bonds. In other words, not all the assets reported as current were available. A committee of reorganization was chosen soon afterward. This committee selected an expert accountant to go over the books and report on both the balance sheet and the income sheet. When the report of this accountant was published, the financial world was simply astounded. In fact, this report in some degree marked the beginning of a new era in railroad accounting. The results of the disclosures showed railway managers how the public looked upon careless accounting, and showed investors how better to watch railroad earnings, expenses, assets, and liabilities.

The report of the examining accountant stated that errors and misstatements had been made in the reports of the Atchison Railroad. It is interesting to examine some of the items in detail. Nearly \$4,000,000 was rebates to shippers. This was really direct cost of obtaining business, and, therefore, should have been deducted from earnings. This amount stood on the books as an asset under the ledger heading "Auditor's Suspended Accounts, Special," though it had no value whatever. On the balance sheet this account had been combined with others, and so could not be identified by an outsider; and this account, moreover, had been credited in 1891 with over \$1,500,000, which had been transferred to "Franchises and Property," thus including in the cost-of-road account an item

purely fictitious. We found some time ago that the increase in Cost of Road was without apparent reason, and this million and a half is no doubt a part of it. The road had another "Auditor's Suspended Account," of over \$2,750,000, which, to quote the report, had been "credited from time to time to the earnings and expenses respectively, but which credit had no foundation in fact." Another item of over \$300,000 counted as an asset was really nothing but an uncollectible balance from a dissolved pool. This was a mere claim against other roads which the other roads had declared unwarranted and had refused to pay; yet for purposes of the Atchison bookkeeping it was a good asset. Operating expenses had been wrongly credited with \$500,000, which had been transferred to capital account. Cash, which had been reported as a little over \$3,000,000, was really less than \$2,500,000, the balance being bad "cash items." Bills Payable, though reported at less than \$7,000,000, had been really nearly \$8,750,000. Accounts Receivable, reported at \$6,000,000, were really only a trifle over \$4,250,000. These last three items alone give a deficit of \$4,000,000. So much for so-called assets that were worthless.

Now let us look at earnings. Equipment to the amount of nearly \$1,250,000 had been worn out and not replaced in the four years ending 1893. The other income, small though it was, had been reported in the last three years more than a million in excess of the actual figure. The interest charge on the funded debt had been understated by nearly \$650,000, the difference being certain worthless offsets which the road had called good.

It is notable that all these misstatements were on matters about which the outsider could get no information from the reports. When to the losses hidden by these misstatements one adds those which we have already read from the reports themselves, one is not surprised at the Atchison bankruptcy.

It is believed that, though many railroad reports of to-day leave facts buried from the unskillful reader, or misinterpreted by optimism, few contain actual misstatements of clear fact as did the Atchison reports between the reorganization of 1889 and that of 1895. After the latter reorganization the road became conspicuous as a leader in the movement for an improved form of report signed by a firm of professional accountants. It is true even to-day, however,

that with even the best form of report and the most detailed and truthful statement of facts, a person desiring to read railroad operations intelligently must learn the language in which reports are written, — must see how the different elements of each part of a report are related to the others, that is, must learn to read between the lines.

What is true of railroads is true to great extent of all lines of business. Certain relations should exist between capital, revenue, production, and costs. The accounts should be so kept that the actual relations may be seen; but no man is really competent to judge of the status of a business or of the value of an investment unless he can read between the lines of published reports and see the meaning of the facts presented, — and this can be done only by careful analyses and comparisons.



## CHAPTER FIFTEEN

### ACCOUNTING IN REORGANIZATIONS

As good an illustration as we can find for the principles underlying the application of accounts to reorganizations is afforded by the two reorganizations of the Atchison, Topeka & Santa Fé Railroad mentioned in the last chapter. It is desirable to get as a preliminary to a study of them a view of the commoner kinds of bonded indebtedness.

The most common form of such indebtedness is the mortgage bond, which provides by way of security that on failure of the borrowing corporation to meet its indebtedness the lender may seize the property. A general mortgage bond will include a right to seize practically the whole property of the corporation, but special terms may provide that only specific named property shall be subject to the mortgage. When the funds raised under a mortgage have been exhausted and it becomes necessary to raise more, it may be possible to issue second-mortgage bonds upon the same property. These give a claim upon the property enforceable only after the claims of all holders of first-mortgage bonds have been satisfied. Such bonds, then, are likely to meet with a sale only when the first mortgage is in amount considerably below the recognized value of the property. In some cases even a third mortgage may be issued, its value being practically nothing unless the claims of the first two sets of mortgages are more than covered.

An income bond, unlike the mortgage bond, gives no security in the property of the corporation. It is a claim upon the corporation's income only. If income is not earned, the holder of the bond has no recourse. If it is provided in the terms of the bond that the claim to income shall be cumulative, defaulted interest in bad years must be made up from the earnings, when large enough, in the subsequent year or years; and, of course, payment for interest on income bonds must be made before any dividend can be paid, but

is not to be made until after all interest upon mortgage bonds has been paid.

Another form of bond, less common in this country than abroad, is the so-called debenture. In one sense this is hardly a bond at all, but is merely a promise of the corporation; for no specific property or income is attachable as security for the payment.

A specific form of mortgage bond that has come into prominence of late years is the so-called equipment or car-trust bond. This sort of bond is usually issued in series, payable at yearly intervals, and allows a railroad to pay for its equipment on the installment plan. The peculiar feature is that the title to equipment bought from the proceeds of such bonds remains with the lenders until the debt is paid. Thus the bondholders are secured by a claim that takes priority over even general mortgage bonds — but only to the extent of the specific equipment bought with the money.

Another recent development in bond issues is the collateral trust bond. This practically always originates from the combination of various corporations, so that one chief corporation holds and administers the property of several minor ones. The chief corporation, in order to raise means to control the inferior ones, deposits with trustees stock or bonds of these inferior companies as collateral, and with the funds raised carries on its purchase or control of additional stocks and bonds. The trust in this case is simply a security that the money loaned shall be put to the use specified and that the stocks and bonds of inferior companies shall be kept intact as security for the principal loaned. The name "collateral trust" very well indicates the form of the condition. The trustee is usually a trust corporation, and the bonds and stocks of the inferior companies are usually deposited in its care.

Though various other sorts of bonds are upon the market, the only one of which the name does not sufficiently indicate the nature is the prior-lien bond. This is issued only under unusual conditions, for, as the name suggests, a prior-lien bond issued late takes precedence of all earlier bonds. The best illustration of this is the issue of bonds by a receiver for a bankrupt corporation to raise money for continuing the business. In this case what has happened is that the courts have intervened to protect claimants, and the loan of

money to assist in the process rightly constitutes a claim enforceable in advance of all the old claims which it assisted to save.

The first task of a reorganization committee is to see that people having various classes of claims upon the property shall be satisfied in proportion to the value of their claims. When many classes of obligation have been issued it is a matter of great difficulty to determine not only the priority of each claim, but also the probability of payment in each case if reorganization should not occur.

In the Atchison case of 1895 the task of the trustees was much simpler than it otherwise would have been because the reorganization of 1889, which we shall consider later, had consolidated forty-three forms of obligation into two. The funded debt in 1895 consisted of but four main types of bond. Of course the first thing to provide in a reorganization is a reduction of fixed charges so that they can be met without danger of default. A railroad, unlike most corporations, cannot well go into insolvency, pay a certain percentage on the dollar, and then shut down. It is a going concern, and so long as there is a possibility of its ever doing business the creditors had rather take what they can now get and retain a claim on the possible future prosperity than to take a fixed percentage now and give up all other claims. First, then, the reorganization committee must show what is the maximum that the road can surely pay. Secondly, they must determine what would constitute a fair claim upon the future prosperity of the company. Thirdly, they must see what are its immediate needs in the way of cash for conducting business economically, for presumably if it needed reorganization it had no adequate supply of cash and was necessarily somewhat run down in an effort to pull through its trouble. In this Atchison case, then, there were four classes of obligations to be treated in such a way that each should make enough sacrifice, and not too much, in regard to each of these three phases of reorganization, — that is, reduction of fixed charges, claim on the future prosperity, and contribution for immediate cash needs.

The first class of obligations were various small lots, as equipment trust bonds, which, since they were a first claim on specific property of the road, were very clearly worth par. Indeed, if they were not provided for, the rolling stock which secured them could be carried off. No one could deny, therefore, that the holders of this class of

obligation had claims upon which they could not be expected to make any considerable sacrifice. They were given in return for their claims an issue of prior-lien bonds, in the main bearing the old rate of interest and to the old par value. These involved a fixed charge on the future of a little over half a million dollars.

The earnings of 1894 under the receivership had been about six million dollars, and it was thought safe to pledge the road to pay about four and a half million in fixed interest charges. Since the prior-lien bonds would take about half a million, four million would be available to distribute among the holders of the other obligations. These other obligations as they stood involved a fixed interest charge of nearly \$10,000,000, and consequently must be cut down more than one half in such fashion that each must sacrifice in accordance with the proportionate value of the security upon which it was based. The most valuable bonds after those already mentioned were general mortgage bonds, which had first claim upon the main property of the road. These were both morally and legally entitled to all the earnings up to \$5,000,000 required to pay the 4% interest on them; but, since this sum could not be earned in the immediate future and yet was secured by mortgage, these bonds were a danger to the stability of the road, — for when interest should be defaulted a clique of bondholders hostile to the new management might institute foreclosure proceedings. It was better for the bondholders to accept a smaller claim for interest in new bonds and receive in compensation for the sacrifice a claim on the future earnings of the company than to attempt to force with the old bonds a demand that the road could not meet. An arrangement was therefore made that holders of the general mortgage bonds could exchange an old \$1000 bond for a new general mortgage bond for \$750 and receive in addition \$400 in what was called an "adjustment bond." This adjustment bond was for the first five years of its life to be a claim upon income only, at the rate of 4%, and that claim was to be non-cumulative; but after the expiration of five years, the claim upon income was to be cumulative, so that if the income was not earned in one year it should be made up out of the earnings of subsequent years. The total life of the bond was one hundred years. The proportion of these two classes of bonds, giving a total of \$1150 for \$1000 in the bonds surrendered, was determined on an interesting basis.

The holders of the old general mortgage bonds had received no interest for two years during the period of the reorganization. For this they were entitled to \$80. The new adjustment bonds gave a claim to interest only if it were earned, and as such earning was not wholly probable the holders were entitled to some claim upon the future in compensation for the sacrifice. The sacrifice was deemed to be equivalent practically to \$70. Consequently, of the \$150 additional par value of new bonds given in exchange for old, \$80 was given because of the lost interest during the reorganization, and \$70 as compensation for the non-cumulative element in the adjustment bond.

The issue of new general mortgage bonds and adjustment bonds, with the prior-lien bonds already mentioned, would consume practically all the assured earnings of the road for a number of years. Holders of the original second-mortgage bonds, therefore, must postpone all their claims until the somewhat distant future. It was right that this should be so, for these bonds were subordinate to the others. If the mortgage had been foreclosed, moreover, these bonds would have proved practically worthless, for the road was incapable at that time of earning more than enough to pay interest upon the first two classes mentioned. The holders of these second-mortgage bonds, then, recognizing, as they must, the poor value of their property, could not well object to a demand that they make a considerable sacrifice. They were asked to contribute some ready cash for the reorganization of the property. They could see that their bonds were worth at present practically nothing; and they could see that a liberal contribution in cash ought to put the road on a good paying basis for the future, so that their property would become valuable. They contributed in cash 4% of the amount of their bonds, and received 5% non-cumulative preferred stock to the amount of the par value of the bonds which they surrendered. This exchange of bonds for stock of course surrendered their right to seize, on a mortgage, the property of the corporation; but since an attempt to enforce the old mortgage claim would have resulted simply in getting payment for the holders of first-mortgage bonds without benefit to themselves, the right which they surrendered was practically worthless, and preferred stock was as good as anything they could fairly ask for. The holders of these second-mortgage bonds could hardly believe that if

they paid off the first-mortgage bonds and attempted to run the road themselves they should make more than under the present arrangement; and in that case they would be forced to advance a large amount of money. Since their second-mortgage bonds had borne but 4% and their preferred stock was to bear 5%, the arrangement was a fair one, for if the road should become prosperous their new 5% preferred stock would be better than the old 4% bonds. These old second-mortgage bonds had been of two classes. Class A had given a claim to interest at an increasing rate until it reached a maximum of 4% in five years; and Class B was to bear interest regularly at 4%. Class A was accordingly exchanged at the rate of 113% of its face in preferred stock, and Class B at 118%.

The old stock was converted into new common stock, and stockholders were assessed \$10 per share to help rehabilitate the road. For this \$10 assessment they received new preferred stock. This, of course, was a just treatment of the holders of old common stock, for the stock gives no claim until all other obligations are satisfied, and it was these men who were under the greatest obligation to furnish the road cash for putting it upon its feet once more.

It is interesting in this connection to note the bookkeeping effect of these transactions. The preferred stock was increased \$22,500,000 over the corresponding bonds, and the new bonds were increased \$19,500,000 over the corresponding old bonds. The result was an increase among the liabilities of \$42,000,000, offset by an increase of cash assets of about \$13,000,000. Some other assets, however, were found, as we have seen, to be highly overvalued, and were written off. It was inevitable, therefore, that the flexible assets should be written up in some fashion, so that the increase of liabilities should be properly offset. Cost of Road was actually increased nearly \$40,000,000, and this was clearly due to the increase in capitalization, — not arising from earning capacity, but demanded by mere bookkeeping convenience. In one sense this was correct, for if the par value of bonds outstanding could be increased arbitrarily and a part of the ultimate security for those bonds was the cost-of-road account, the cost-of-road account must be written up to correspond with the increase of bond issue. To be sure, the situation was somewhat forced, and no one could say that the road itself was voluntarily accepted as security for so large an issue of bonds, but the

fact remains that the relationship did exist. On the balance sheet the peculiarity of the situation was partly covered by the elasticity of the title of the account, "Cost of Road and Franchises." This furnishes a very good illustration of the fact that a cost-of-road account does not necessarily represent either the actual cost or the capitalization of the earning capacity.

The previous Atchison reorganization, in 1889, which much simplified matters for the reorganization of 1895, is interesting for the great variety of obligations consolidated. Nine of the forty-three kinds were issued by the Atchison proper, some were general mortgages upon subsidiary lines, some were mortgages upon specific pieces of property or branch lines, and some were income bonds. The general condition was therefore extremely complicated. This reorganization of 1889 was conducted without putting the road into the hands of a receiver and was undertaken to reduce the fixed charges before a default in interest should become necessary. The task was to determine the real proportionate value of these forty-three kinds of obligation. The fixed charges before this reorganization had been over \$11,000,000, and it was necessary to reduce them to about \$7,000,000. Since the reorganization was voluntary, it was not possible to reduce the maximum rate of return for any class of obligation; but each was to be offered such an apportionment of practically certain return that the success of the reorganization plan would be assured. The allowance for difference in value between the different classes of old bonds was accomplished by the apportionment of differing ratios of mortgage bonds and income bonds to each. For example, the bonds supposed to be the best of the forty-three kinds, those having the greatest security, were certain 7% bonds. For a \$1000 bond of these were given \$1100 in new mortgage 4's and \$520 in income 5's. The principle was this: the new 4% mortgage bonds would give \$44 in interest, and the 5% income bonds, if the interest should be earned, would give \$26, a total of \$70, which was 7% upon the original \$1000 bonds surrendered; two thirds of this amount was practically certain, being based upon expected earnings, and the other third gave practically as good probability of interest as the old bonds, which the road already found difficulty in meeting; the extra principal, or \$620, was a bonus, but not too much, for both bonds were to run one hundred

years. One of the poorest of the forty-three kinds, a second-mortgage 6% bond on an auxiliary road, was exchanged for \$300 in new mortgage 4's and \$960 in income 5's. The \$300 at 4% would yield \$12, and \$960 at 5% would yield \$48, a total of \$60. Here, one fourth was in practically certain mortgage bonds and the remaining three fourths was in the very doubtful income bonds, which might yield nothing for years. Yet even in this case the probability of income was practically as good under the reorganization as under the former plan.

Thus the risks were apportioned among the forty-three classes so as to give each a fair exchange for its estimated value and security; and the new bonds were of a sort to simplify very much the administration of the finances of the company. In 1892 the income bonds were converted into second-mortgage bonds, and additional second-mortgage bonds were issued for cash to enable the road to make extensive improvements. As we have seen in our study of the history from 1891 to 1893, however, the interest on these could not be met, and in 1893 even the mortgage 4's became doubtful, so that the other reorganization of 1895 was necessary to cut down once more the fixed interest charges to \$4,500,000.

These two cases of reorganization suggest, of course, but a few of the many devices; but they indicate the general principles and show sufficiently how accounts are called into use and how they are affected by changes of this sort. Unless based on adequate knowledge of actual and probable income, reorganization schemes are doomed to failure. The Atchison reorganization of 1889 was based on an estimate of income that was never realized; and within four years a new plan became imperative.



## CHAPTER SIXTEEN

### SOME GENERAL PRINCIPLES ILLUSTRATED IN BANK ACCOUNTING

In some respects bank accounting is peculiarly simple, for everything handled has a definite stated value in dollars and cents. In most respects it is useless to try to keep track upon the books of the specific article traded in, for identification of bills and coin is unnecessary. Of notes, drafts, bonds, stocks, etc., however, it is always desirable to keep a complete record. The bookkeeping with regard to notes and drafts is explained in Appendix A, II; and the record of stocks and bonds may be best shown in connection with trust accounting. For the ordinary transactions of banking, the chief accounting peculiarity, aside from the mere mechanical details of keeping the books, is the form of the balance sheet, which depends upon several things of a technical nature.

For instance, the national banking law requires that each bank shall conform to certain regulations for its membership in the national banking system, shall maintain security for its bank notes issued, and shall keep a specified reserve for deposits. The published balance sheet should give the necessary information concerning the fulfillment of these requirements.

On the debit side of a bank balance sheet the first item is usually Loans, or Bills Discounted. These are often divided into several classes, according to the sort of transaction, — for instance, commercial paper, time loans on collateral, etc. The second item, or group of items, is usually United States Bonds. Since all national banks must hold a certain amount of such bonds, the amount varying with the amount of capital stock, this item must be stated by itself. If bank notes are issued they must be secured by government bonds on deposit at Washington, and hence the amount of such bonds must be stated by itself for comparison with the notes outstanding. If the bank is a depository of government funds, it must have on deposit in Washington government bonds for security; and therefore these bonds must be stated by themselves for comparison

with the government deposits with the bank. So all national banks must have one lot of government bonds, and may have two or three. The next item is stocks, etc., which must be stated because national banks are not expected to hold stocks except as they may come into possession through the confiscation of collateral or acceptance to secure themselves against loss in case of debt. The next item is sums due from reserve agents. This is of great importance, because the national banking law provides that of the reserve required to be maintained by each bank a certain proportion may be kept on deposit with other designated banks in what are called reserve cities. In the case of banks not in reserve cities three fifths of the total required for reserve may be kept in such reserve-city banks; and for banks in reserve cities one half of the required reserve may be kept on deposit with banks in what are called central reserve cities, — New York, Chicago, and St. Louis. The next item is usually sums due from other banks, that is, banks not designated as reserve agents. The significance of separating these items will appear later, with the reason for stating separately the next two items, clearing house items and checks, and national bank notes held as cash. Next appears the item of lawful money, which includes only those sorts of money which may be counted as reserve for deposits — and national bank notes are not among them. The last item of importance on the assets side of the balance sheet is the redemption fund with the United States treasurer, a fund required by law to be constantly on deposit in Washington, if notes are issued, to enable the treasurer at all times to redeem such notes. The amount of this fund is 5% of the amount of notes outstanding from any bank.

Upon the credit side of the balance sheet the first item is of course Capital Stock, which is required by law to be of a certain minimum. The next item is Surplus, and this must be distinguished because national banks are required to set aside of their profits a certain proportion until a reserve shall have been accumulated of 20% of their capital stock. The next item is Undivided Profits, which theoretically is simply small sums which the bank has deemed hardly worth while to distribute to stockholders, though commonly this is allowed to accumulate, furnishing a second surplus. Next appears the amount of national bank notes issued and outstanding.

This, very clearly, must bear relation to the amount both of government bonds and of the redemption fund on deposit with the treasurer at Washington to secure that circulation. Next is the amount due to other banks, to be considered later. Finally comes Deposits, for which the required reserve, 25% in reserve cities and 15% in other places, must be constantly maintained.

It would appear to be a simple matter to determine the requirement of reserve by applying the proper percentage to the figure of deposits given upon the balance sheet. When the national banking law requiring this percentage of reserve came to be applied, however, the Comptroller of the Currency found many complications. He was asked, for instance, whether, since national bank notes are not included in lawful money, a bank holding many such notes of other banks would be required to maintain just as much reserve in lawful money as another bank which had only a small number of such notes. The national bank notes are secured at Washington, and it seems hardly fair that they should not be counted at all in determining the reserve for deposits. The Comptroller ruled that though national bank notes could not be included with lawful money to offset deposits on the basis of four for one (25% reserve), or six and two thirds for one (15% reserve), as lawful money could be counted, they might be allowed to count on the basis of one for one; that is to say, the amount of national bank notes held might be subtracted from the deposits before the requirement for reserve should be figured. So one dollar in bank notes will reduce by one dollar the amount of deposits required to be covered. Since the Redemption Fund for redeeming bank notes is in lawful money, it may be counted, while unimpaired, on a basis of four for one or six and two thirds for one as reserve for deposits.

The Comptroller was also asked whether, since the sums due to other banks (which of course are deposits) must be included in the deposits for which a bank must maintain a reserve, sums due from other banks might not be counted to offset such deposits. He ruled that sums due from other banks might be counted to offset sums due to other banks; but if there were any excess of sums due from other banks over the sums due to other banks, such excess should not be counted to offset other deposits. This allowance sometimes raises a problem that only a complicated mathematical process will

solve. This problem is interesting to note. Up to a certain limit a bank may count its own deposits with reserve agents, as already indicated, on a basis of four for one or six and two thirds for one, to cover deposits made by others with it. Sometimes it has on deposit with reserve agents a sum so large that not all of it can be counted to cover its own liability for deposits (as already indicated, only one half of the reserve of reserve-city banks may be kept on deposit with reserve agents, and only three fifths of the reserve of other banks may be so kept). In part we determine the amount of deposits requiring reserve by subtracting from sums due to other banks the sums due from banks not reserve agents. The balance is a part of the deposits requiring reserve, and this determines how much may be counted of the sums due from reserve agents. Sums due from reserve agents in excess of this may be counted to reduce, further, not four for one or six and two thirds for one but one for one, the sums due to other banks and requiring reserve. This last reduction itself reduces the amount which may be counted as reserve with reserve agents; and this new reduction increases the excess with reserve agents, and reduces the liability for sums due other banks, — which in turn reduces the amount counted with reserve agents, increases the excess, and so on, *ad infinitum*. The escape from this interminable process is, of course, a mathematical formula of an algebraic type, which is not necessary to examine here. One method of treating the problem is illustrated in Appendix F, page 333.

Similarly, the Comptroller ruled that, since clearing-house items (checks and other items ready to be presented against other banks) are of the same nature as sums due from other banks, they might be counted on the basis of one for one against deposits and might be subtracted from the amount of deposits before the requirement for reserve should be figured.

It is now evident why a bank balance sheet distinguishes many items which are apparently of a like sort, as bank notes from legal tender.

The form used makes it possible to know practically all that need be known except the one most important thing, which nothing but the books themselves or the original documents could possibly tell. The most striking characteristic of bank accounting as distinguished

from other types is the fact that two banks with identical balance sheets may be utterly dissimilar in solvency. The most important item among the assets of a bank is its loans, and of the value of these nobody is able to form any judgment unless he knows the details of them and knows, better than almost any one can know, the character of the men who take responsibility for them. Upon practically every other sort of commercial property it is possible to make some sort of estimate of value; but when a bank happens to have many eggs in one basket a few commercial failures, perhaps all consequent on one mischance, may cause it to go under in spite of a very fine showing on its balance sheet. This has been illustrated many times. Only one who can see the details of the loans can form an adequate judgment of the real solvency of the bank. Many disclosures of the last few years have indicated that with alarming frequency directors turn over to subordinate officers what they should recognize as their own responsibility; and practically all the bank failures which have excited general comment could have been avoided and would have been avoided if any one with proper responsibility had examined the loans and the adequacy of the security for them.

More often in banking than elsewhere has embezzlement proved possible; yet this should not be the case. There is but little more reason why embezzlement should be common in banking than in any other lines of business. The explanation here, as in the matter of loans, is that not sufficient responsibility has been taken by those in charge. The ways by which theft may be temporarily covered are numerous, but none of them will escape proper examination; and by proper examination is meant not such examination as can be given by bank examiners — for their work is necessarily hasty and somewhat superficial, — but only such as most banks can provide for themselves. In most large banks the number of clerks in each group is so large that the duties can be often changed. Wherever it is known that any day the clerk who has been accustomed to work at a certain desk is likely to be shifted to another and a new man is likely to take his place, no one dares to leave his work at night with a bookkeeping lie behind him. This method of constantly changing duties is coming to be more and more widely adopted and is proving efficacious. Every man on taking a new task is held responsible for the correctness of his balance; and every man is, therefore, bound to see that

the accounts of his predecessor are correct before he is willing to perform any new transactions. Unless dishonesty affects the whole group, the system furnishes its own check. When the changes are made frequently and impersonally throughout a bank, no man can feel offended at finding his duties changed; the change is no violation of tact or implication of blame to any one. In practically every case of conspicuous embezzlement for many years it has been noticeable that the thief has been unwilling to take a vacation. For instance, the commonest method of embezzlement is to tamper with inactive accounts of depositors. A clerk who knows that certain accounts are unlikely to change often may make on his books many changes in such accounts with practical certainty that the discrepancy will not be detected if only he can transfer those discrepancies in due time to other accounts which have become inactive while the first accounts were becoming active. In a case discovered a few years ago a clerk had been carrying on this sort of process for many years, trusting entirely to his memory as to the names and amounts of changes — but of course he never dared to take a vacation. In another case a bank clerk in charge of the incoming mail had taken regularly from each day's mail enough checks and drafts which had not yet been recorded to cover his discrepancy of the day before. That is to say, he had always at his disposal a large body of unrecorded checks and drafts whose existence he only of all the people in that bank knew anything about; and it was a very simple matter for him to make his accounts balance by using some of those unrecorded items to settle the accounts of the day before. He, too, never dared to take a vacation; but when, on account of sickness, one was forced upon him, the discrepancy was instantly discovered. Obviously if the plan mentioned above had been applied in either of these cases, the embezzlement could not have continued.

## CHAPTER SEVENTEEN

### SOME GENERAL PRINCIPLES ILLUSTRATED IN TRUST ACCOUNTING

A TRUST may owe its origin to any one or more of several things. A trust company as well as an individual may be the administrator or the executor of an estate; it may hold property as guardian for a minor or an incompetent person; it may manage property for persons in ill health or abroad; it may take charge of marriage settlements; it may serve as assignee or receiver in bankruptcy proceedings; and it may serve many other similar functions. The chief peculiarity of trust accounting is that the books must show not merely how much property and income are to be accounted for in each trust, but what particular property belongs to it; for even though a trust fund is earning but little and the average earnings of investments held by the company are high, the beneficiary of the trust has no claim to the earnings of other trusts.

Each trust involves usually three elements, — principal sum, invested sum, and uninvested sum; and the amount of any one of these is likely to be at any time changed by income or loss. A trust ledger, therefore, must be so arranged that a page or a portion of a page allotted to each account shall show at a glance these three elements. A convenient arrangement for such a ledger is to have three separate groups of columns, one each for principal, income, and investment; the difference between the investment and the principal is the uninvested part. To make the record complete, a column for the debit and one for the credit is usually provided for each group, and for the sake of making immediate reference possible a balance column is also desirable for each. Such a ledger would look as follows:

ACCOUNTS

Compensation . . . . . %		Administration of the Estate of . . . . .						Trust No. . . . .										
Date	Item	Voucher No.	Income			Principal		Investment										
			Debit	Balance	Gross Credit	Commission	Net Credit	Debit	Balance	Credit	Debit	Balance	Credit					

[The use of a number for the trust makes simple many minor references to it. Since all trust accounts must be exactly vouched for, documents will always be available for reference. These should be numbered and filed, and reference to them on the ledger is easily made. The trust company's compensation is practically always for handling revenue accounts, and hence a column for commission is necessary only in that group.]



The trust ledger is, of course, a subordinate book, for an account is provided in the general ledger to cover the total of all trusts. When a trust is opened, the account in the trust ledger is credited, in the column provided for principal credit, with the principal sum, and, if the principal is all invested, the same amount is extended into the debit investment column. In this case the debits and credits are equal; for the trust company is responsible for the property as agent, and it registers on its books both the liability for the property and the asset with which to meet that liability. If any part of the principal is in cash, it is not necessary to enter the fact, for the difference between the two columns — that is, principal credit and investment debit — shows the trust company's liability for uninvested sums. When income is received, income is credited in the gross credit column, the commission is deducted, and the net amount is extended into the net credit column. When payments on account of income are made, such as taxes, repairs, insurance, or distribution to persons authorized to receive income, the amount is debited in the debit income column. Balance of income intended not for distribution but for increment of principal may be transferred to the column for principal credits at any time, and until invested it shows as a cash liability of the trust company. Similarly, principal distributed is entered in the principal debit column, and investment sold is entered in the investment credit column.

Many subordinate books are necessary for handling the details of trusts. A mere mention of a few for illustration will serve our purpose here. In the first place, a record must be kept of the details of the terms of each trust, — that is, the terms of a will or deed or mortgage or assignment creating the trust, sometimes including special instructions as to how the trust funds may be invested, and usually including provisions as to the distribution or the accumulation of the fund. This is, of course, a legal matter of great importance. Of course, too, a schedule of the specific property belonging to each trust must be correctly entered, designating the particular stocks, bonds, mortgages, loans, real estate, etc., even mentioning them by number when any number is attached. The necessity for this may not at first seem obvious; but in case a trust company holds numerous bonds of the same class belonging to different trusts and some of them, in accordance with the terms of the issue of the bonds,

are called in for redemption, the trust company must know to which trust belong those called in, for the call may mean the need of reinvestment at a lower rate in some other security. Each trust must suffer its own losses and receive its own gains. Sometimes blanket trusts are created, each beneficiary of which is to share proportionately; but each trust of that sort is a unit, however numerous the beneficiaries may be.

If the trusts are many it is desirable to keep also a list of securities arranged not by trusts but by titles, so that at any time the company's holdings of any particular security may be easily learned from the books. Many trusts are held under such terms that it becomes the company's duty to change the investment under changing conditions, and unless a careful index is kept of the different investments sufficient watchfulness cannot be exercised.

If loans are made on collateral, the property held as collateral must be indexed on still other bases. An index must be kept of the collateral for each loan, so that one may learn at a glance whether on a downward market the security is ample for the loan; an index must be kept for each kind of security held as collateral, so that when a stock or bond becomes questionable instant reference will show upon whom to call for more collateral; and another index must be arranged on the basis of borrowers' names so that one may learn at any time the total amount of all loans to any individual.

The details of investments are recorded in subordinate ledgers. In a large concern there would be separate ledgers for bonds and for mortgages, but the principle is the same for both except that the latter must usually provide for partial payments. A bond ledger is arranged usually with space for recording not only purchases and sales, that is, ordinary debit and credit to the account, but also for interest payments and for amortisation figures, for each separate holding. Interest payments must be recorded so that defaulted interest may be shown. Good bookkeeping requires that on such a ledger interest shall be debited whenever due and credited whenever paid. The amount due and unpaid is then always distinctly shown as a balance. An investment corporation will usually divide its interest account, as already indicated in Chapter XII, into three accounts, — Interest Accrued, Interest Earned, and Interest Due. Only the last of these need appear on the bond ledger, of course;

the others are figured periodically and are entered on the principal books only. Usually, for convenience, columns are provided in the bond ledger to preserve the cost value and the market value, — not, of course, to be included in the balance-sheet figures, but for general information.

In the treatment of sales of bonds care must be taken that the book value be not thrown out of accord with the facts. If, for instance, when the book value of \$100,000 worth of bonds is at \$100,290, one half of those bonds is sold for \$51,145 (a profit of \$1000) and the bond account is then credited for the amount of sales, the balance will show on the books \$49,145, which would mean, if it means anything, that the value of the bonds remaining on hand is at that figure; yet we know from our amortisation table that the value of those bonds is \$50,145. In other words, if we include, in a credit to bonds, profit upon bonds sold, we thereby decrease upon the books the apparent value of the bonds remaining. To express the same thing differently, if you take off more than half, the remainder is necessarily less than half; and if you credit the bonds sold for more than the book value, you leave the bonds remaining at a figure less than the book value. Your effort to keep your book value recorded has been wasted. The escape from this is to maintain a special account, Bond Sales, and when bonds are sold debit it for the book value of the bonds and credit it for the selling price. This leaves on the bond ledger the remaining bonds standing at their exact book value and Bond Sales showing a profit or a loss of the difference between selling price and book value. Hence at the end of any period it is easy to see exactly what has been the profit or the loss upon the sale of bonds; whereas if this account were not maintained and sales price were confused with book value in the account of each class of bonds, not only would book value be lost, but an inventory of all bonds would be necessary before one could determine profit.

Finally, something like a tickler should be kept, usually on cards, showing what securities or real estate should bring in interest or dividends or rents at certain dates.

The balance sheet of a trust company or trust department of a larger institution would have but few items, but these items should be arranged in such fashion as to show the terms under which the

assets are held. For instance, on the credit side of the balance sheet, the trusts should be divided by classes, showing the terms under which they are held, as, for example: —

- As Executor
- As Administrator
- As Guardian
- As Receiver
- As Agent
- etc.

On the debit side it is desirable that the classes of investment should be designated somewhat as follows: —

- Registered bonds
- Coupon bonds
- Stocks
- Mortgages
- Collateral loans
- etc.

Many trust companies maintain a separate department for corporate trusts, serving corporations in such work as paying dividends, paying interest, transferring stock, holding bonds as collateral for the security of collateral trust bonds. Where much of this business is done, the balance sheet may well be divided into two parts, individual trusts and corporate trusts, reporting the assets separately for each.

## CHAPTER EIGHTEEN

### SOME PECULIARITIES OF ACCOUNTING FOR INSURANCE AND FOR LIFE TENURES

ONE of the commonest types of annuity, of which the principle was discussed in Chapter XII, is attached to life insurance policies. Though it is a rather common thing for a life insurance company to issue annuities for a definite number of years, this is done usually independent of the life insurance business, — as any other financial institution might issue such annuity. The normal form of annuity in connection with life insurance is not an annuity which the company sells but one which it buys, — namely, annual premium on policies. This affords an excellent illustration not only of the method of annuities, but also of a striking type of deferred liability. It will be worth while, therefore, to examine in some detail the principle upon which life insurance is founded.

At the basis of all is the question of expectation of life. The work of determining how long a man is likely to live devolves upon mathematicians who are usually called "actuaries." From elaborate tables of vital statistics accumulated from many years of experience they have learned how many men out of every thousand are likely to survive to a specified age. If, for example, the statistics of the nineteenth century show that of every thousand men thirty-two years of age ten died in the first year, eleven in the second year, and so on, it is a fair assumption that something like the same numbers will die in the years of the twentieth century, allowing, of course, for improved medical and surgical skill; and it is possible on such a basis to figure the reasonable expectation of life for any man at any age.

The method of determining the amount of annual premium, or annuity for life, which any man shall pay for a life insurance policy promising to pay a definite sum at death can be best explained after determining the sum which would be necessary to buy what is called a paid-up policy, — by which is meant a sum paid down once for all to insure the man for life. A certain table shows that of 84,-

000 men at the age of thirty-two, 723 will die in the first year. What will be the cost, then, of insuring 84,000 men at the age of thirty-two for \$1000 each for one year? If the insurance is to terminate at the end of the first year, the only liability which the company assumes is to pay \$723,000 for that year. The amount paid by those who take out policies is, of course, to be paid at the beginning of the year. We cannot determine the days at which the death claims will become due; but, for the purpose of illustrating our principle, let us assume that at whatever time the death occurs the claim on the policy will be made at the end of the year. It is obvious, then, that in order to enable the company to insure these 84,000 men for one year, such a sum must be paid by each at the beginning of the year as will produce \$723,000 at the end of the year. The expenses of conducting the business we may omit from our calculation for the present. We have, then, only to divide our \$723,000 by 84,000, and then see what sum invested for one year will amount to that quotient. The quotient in this case is \$8.61; but since \$1.00 invested for a year will on a 4% basis, which we may assume here, amount to \$1.04, it will take but \$8.28 invested at the beginning of the year to produce \$8.61 at the end of the year. Consequently the cost of insurance for these 84,000 men for one year is \$8.28 each. The same sort of process applied to the second year gives us \$726,000 to raise, for in the second year a larger number of deaths will occur; this gives \$8.64 for each man, but when this last figure is divided by the amount of \$1.00 invested for two years, which is actually \$1.0816, we get a cost for each man of \$7.99. This cost for the second year, if added to the cost for each man for the first year, will show us the cost of insuring each of 84,000 men for two years, or \$16.27. The same process for the third year, with 729 deaths, gives \$8.68 direct cost for each man, which, less the accumulation of interest for three years, produces a net cost of \$7.72. If, now, this process is continued for every year in which any of the original 84,000 men shall be living, the total is the cost of insurance per man for life. This is actually \$308.71. This is the cost of a paid-up policy for men at the age of thirty-two, assuming payment to be made at the time the policy is taken out; and this sum paid by each man will yield sufficient money, if the expectation of life proves exactly true, to pay the last \$1000 at the time that the last of the 84,000 men shall die.

It is obvious, however, that the average man is not able to buy a paid-up policy. It is the desire and the necessity of most men to pay insurance from income; and, therefore, this paid-up sum of \$308.71 must be converted into an annuity; and we can best illustrate the principle by assuming that the payment of the annuity is to continue during the man's life, though many policies are made out for a limited number of payments. Since the cost to the company is \$308.71 for each of the 84,000 men, the total cost or total paid-up insurance will be \$25,931,640. We have now to determine what annual premium paid for life by each of the men will produce this figure. Since we are to convert a present sum into future payments, we have a double allowance to make: since the premiums are life annuities, every death means the termination of one of the annuities; but all paid annuities are accumulating interest. In order to determine how many dollars each man must pay, we may best take \$1.00 as a basis and learning the amount of an annuity of that sum divide our \$25,931,640 by it and thus learn how much should be the annual premium to produce the result we are aiming at. The first premium will be paid by 84,000 men, for all will be living at the time of taking out the policies. The amount of the first premium on a \$1.00 supposition is \$84,000. At the end of the first year, as we have already seen, 723 men will have died; and consequently 83,277 will pay the second premium. This second premium, however, being paid only at the end of one year, cannot be set off dollar for dollar against the cost of the paid-up policy with which we started, for a dollar to be paid at the end of the year is worth but \$.9615; and consequently the present worth of the premium paid by the 83,277 men will be but \$80,070.84. At the end of the second year, 726 additional men will have died; and consequently but 82,551 will remain to pay premiums, and the premiums which they pay, being due only after two years, will have a present worth of not \$1.00 but only of that sum which it will take to produce \$1.00 at the end of two years, namely, \$.9245; so their payments will amount to \$76,318.40. At the end of the next year, 729 additional men will have died, leaving 81,822 to pay premiums. But these premiums are to be paid only at the end of three years, worth each but \$.8890, or a total of \$72,739.76. This process carried through the whole time until the last man shall have died will produce \$1,509,408.62, on the assumption

that each premium is \$1.00. Now, dividing our \$25,931,640 by our \$1,509,408.62, we get the amount of premium necessary to realize the total amount required, or \$17.18. This, then, exclusive of expense and assuming death claims to be payable only at the end of each year, is the annual premium required to insure a man at the age of thirty-two for \$1000 for life.

Now appears what seems at first glance to be a striking inconsistency. We found the cost of insurance for the first year to be \$8.28; but we have just shown that the premium for the first year as for all years must be \$17.18. This discrepancy between the first table of cost and the final conclusion with regard to the annual premium underlies the important matter of life insurance reserves — a matter often misunderstood. This we must now examine.

The first figuring of cost was on the basis of a paid-up insurance, assuming that every man of the 84,000 paid something, at the time of insuring, for every year, including that when the last man should die. When we come to convert this payment into an annuity, however, only in the first year will 84,000 men pay any premium. Enough must be accumulated, therefore, in the early years, when the deaths are comparatively few, to offset the large number of death claims in the later years, when the premiums are comparatively few. This can perhaps be best made clear by considering the comparative receipts and expenditures in the last year of the duration of the policies. Let us suppose that the last man of the 84,000 survives one year longer than any other. The receipts of the company from premiums in that year will be obviously \$17.18, because that is the annual premium and there is but one survivor. The expenditure for that year, however, when that death claim matures, will be \$1000. In other words, the expenditure will be fifty-eight times the receipt. In that year the ratio of deaths to premiums will be 1:1. In the first year it was 1:116. The necessity for a reserve accumulated in the earlier years to meet excess of payments in the later years needs no further illustration.

It is obvious that, unless some error is made in the rate of interest assumed to be earned by the premium or in the number of deaths assumed to occur in each year, exactly enough reserve will have been accumulated on the plan explained above to meet the requirements for the life of the policies. To put the thing in another



way, if an insurance company should discontinue writing policies and should do no other business than to collect premiums upon the policies already written and to pay the death claims as they mature (expense is left out of account), it could perfectly well meet all death claims out of its funds; for the money is in its hands or provided to be in its hands in sufficient amounts at the proper time. Indeed, the company could at any time return to its policy-holders the reserve which has accumulated from their premium payments, cancelling the remaining policies, without loss other than the expense of conducting the business up to the time of cancellation.

Except so far as large numbers increase the probability of fair averages, it is obvious that a cry for increased business is without warrant on the theoretical principles of insurance; and where it occurs some other motive must be found than any connected with insurance proper. As a matter of fact, three such motives have been operative.

So far our figures have disregarded the expenses of insurance. Yet merely to collect premiums, to invest the reserve, and to pay death claims involves an amount of clerical expense, medical fees, and administration charges, sure to amount to a large figure. Every insurance company therefore adds to each pure premium a certain figure for what is called "loading," or expenses. Each company has its own figure, and the variation between companies is wide. Obviously, a big business can be conducted more cheaply than a small one, and in mutual companies properly managed an increase in business means cheaper insurance. This furnishes a motive that cannot be questioned.

It is equally obvious that in proprietary companies the bigger the business the greater is the excess of the loading fund over the actual cost, and the greater is the profit of the proprietors. Recent public investigations have shown very clearly that even in mutual companies when immense sums have to be expended things which ordinary policy-holders deem of great consequence are likely to appear trivial and to be lightly treated. Many high officials seem to try to escape the trivialities of small affairs. A large loading fund relieves them of care about economy in salaries, commissions, fees, rents, etc.

The third motive for increasing business lies in the use of the

increased reserve. Even assuming a high degree of honesty on the part of officials, the task of investing increasing millions of policy-holders' money gives them financial prestige as important influences in the money market. Such prestige is worth a great deal, even in absolutely honorable ways, for it gives a man in his private capacity opportunities that he would not otherwise meet. To one with a flexible conscience the field for financial operations is almost unlimited.

Various forms of insurance policies other than the pure type explained in the early part of this chapter are commonly issued, — such as the endowment, which provides that the policy shall mature at the latest at a certain date. The principle is the same as in the other case; the difference is simply that the annuity has fewer periods and the maximum maturity is shorter.

Most companies attempt, of course, to put their calculations on such a basis that the premium accumulations will be ample for the reserve; and the mutual companies, planning to reduce the cost of insurance to the minimum, return to their policy-holders any excess which the transactions of the year have shown the premiums to provide. This is commonly done by an annual distribution, which usually can be applied in any one of several ways, — a cash rebate, application upon next year's premium, increase in the amount of the policy, or a reduction in the number of years before the payment of an endowment. Some companies retain this excess as a "deferred dividend" until the maturity of the policy.

The old-fashioned tontine system, by which defaulting policy-holders lose all their accumulated reserve as well as all deferred dividend, is now practically discontinuing. The tendency nowadays is not only to give to all policies a cash surrender value, equivalent to the accumulated reserve less a sum for expenses, but even to make them non-forfeitable, so that insurance is automatically extended for what additional insurance the reserve would buy, — either full insurance for a few years, or a small insurance for life.

It is obvious from this discussion that the balance sheet of an insurance company will be entirely unlike any other balance sheet so far considered. For an insurance company to put into the balance sheet as a liability the face value of all policies written is to produce a figure which it would be impossible to match with assets. The

liability on account of policies is considered to be merely the reserve accumulated on those policies. The amount of this reserve is usually prescribed by state law. Against this liability will appear, of course, the investment of accumulated reserve.

Of other sorts of insurance it is hardly necessary to say anything here. In practically all other kinds, the risk, unlike the risk in life insurance, is constant, for loss by accidents, fire, etc., is not likely to be considerably larger in one year than in another, and so a reserve such as is required for life insurance is unnecessary. Usually a reserve is kept, of course, as in all good businesses, but it differs in nature hardly at all from that maintained by railroads and other large corporations. It is chiefly a safety fund to meet extraordinary losses.

The principles of life insurance are more likely to appear in ordinary business than a casual observer realizes, for many business transactions involve an estimate of expectation of life. For instance, no one can intelligently purchase or sell the widow's right of dower in a piece of real estate without an appreciation of the fact that not only the expectation of life, but the present worth of an annuity, must be at the basis of the calculation of value.

## CHAPTER NINETEEN

### SOME GENERAL PRINCIPLES ILLUSTRATED IN FACTORY ACCOUNTING

THE characteristic of factory accounting as distinguished from the other sorts already discussed is that most of the cost is exact and can be directly connected with the product, though a considerable percentage — much lower than in transportation, however — is of a general sort and must be distributed to the different items of product on a somewhat arbitrary basis.

The first distinction between the different elements of cost in manufacturing should be between manufacturing cost and selling cost. No relation exists between them. Either the manufacturing division or the selling division may be excellently managed and yet the business as a whole produce no profit. On the other hand, either division may be poorly managed and yet the business as a whole produce a good profit. Only when absolute distinction is made between them is it possible to place responsibility. Let us begin with the producing cost.

Producing cost for each article of product is commonly divided into three parts: first, material; second, labor; third, what is commonly called "burden." Burden is the share of general expenses, such as salaries for superintendence, heat, power, insurance, taxes, etc., — expenses incurred not for a particular article but for the factory as a whole, so that each particular article gets the benefit. It furnishes an illustration of a pure joint cost, such as was discussed in Chapter X. The cost of material and the cost of labor on each article of product, however, can usually be determined exactly if enough care is taken in keeping the records. We may well begin with these, therefore, which are commonly called prime costs or direct costs.

Our first illustration may be taken from a factory making goods of many types, chiefly on orders. It is obvious that shop foremen must keep records of all materials used and of all labor employed for every piece of work. It happens that in most complicated kinds

of manufacturing care requires that for every piece of work a written order shall be given to the men who are responsible to produce it, so that error may be avoided in quantity, quality, and dimension. Such orders furnish an excellent basis for accounting. Not only must orders be made for work as a whole, but usually it is desirable whenever a job is cut into several pieces that a separate order shall be given to every man having part in it; and these smaller orders, or "job orders" as they are often called, may furnish a basis for minor accounting.

Let us take for our illustration the manufacture of a steam engine. Our first concern is with the material entering into it. Usually when material is purchased the ultimate destination of it is not known; so Stores is debited. A well-managed factory will have always on hand a large store of material in addition to the particular raw material required for its main product. That is to say, a large shoe factory will maintain on hand a stock of lumber, hardware, etc., in addition to its stock of leather and findings. The stores account in the general ledger is but a summary of many elaborate details kept elsewhere. Most concerns keep what is called a "stores ledger," in which is entered every receipt of goods at the storehouse and every issue of goods from it. This record is kept accurate by requiring the storekeeper to give a receipt for everything he receives and to obtain a receipt for everything he issues. A stores ledger is arranged in such a way that each kind of article maintained in stores has an allotted page or pages exactly as each account has a page in an ordinary ledger; and all supplies of that sort received are debited and all supplies issued are credited. Spaces are provided to distinguish even between different lengths and sizes of screws, nails, lumber, etc. Under this method it is unnecessary for the superintendent or other officers to get special reports from the storehouse to learn what stock is on hand. A properly arranged stores system, moreover, will have recorded usually on the stores ledger a statement of the minimum stock desired, and also a statement of what is considered a standard order for the replenishment of stores. It becomes the duty of the storekeeper under this system to notify the purchasing officers whenever any article of stores approaches its stated limit. Under this plan, there is no danger that — except in extraordinary cases, which should be foreseen by the proper department — delays will

occur because of improper preparation. It is inevitable that there shall be a certain shrinkage or overrunning in the supplies on hand; and it is necessary at occasional intervals to compare the actual supplies with the record in the stores ledger. In other words, it is necessary occasionally to take account of stock. This stock-taking, however, need not be a difficult or laborious task, for it does not need to be done all at once. Ordinarily, of course, if stock-taking is attempted while business is going on, the figures obtained at the end may disagree seriously with the actual stock at any one time during the process. Under the stores-ledger system, however, it is not necessary to take account of more than one kind of goods at a time, — for the only aim is to correct errors. This time, moreover, may be at the convenience of the establishment, and the easy time is always when stores are lowest. So the labor of stock-taking is reduced to a minimum. Sometimes one stores ledger is kept by the storekeeper, and another independently kept in the office. These are compared and adjusted at suitable intervals.

The next question for the superintendent to determine is whether the factory has all the facilities it requires for the construction of the steam-engine. If it happens that the concern is just working into the building of engines of this type and has never built one before, it may need some new facility that will be serviceable not only for this order but for many others. Suppose it needs a large platform or some sort of permanent portable scaffolding that will enable the work to be done readily. This will require material and labor, and for them orders must be issued to the foremen of the necessary departments. If the scaffolding is so complicated that plans are necessary, an order will be sent to the engineer's department to design it. Another order will be sent to the drafting department to draw plans in detail. Finally an order will be sent to the carpenters' department to construct it. In each case the work will be done by authority of a written order, and each order will bear upon its face conspicuously a name or symbol to show what is its nature. In this case, to show that it is the 407th order for the construction of equipment, it might be entitled C. E. 407. All the orders for this construction, to whatever department they go, will bear the same symbol. When, then, the work is finished and the orders have been returned to the bookkeepers, the symbol upon the face of each order

indicates to what account charges should be made. In this case, since the work is for construction of equipment, a charge should be made to Equipment, or some similar capital account.

Now let us follow through some details of this order. The foreman of carpenters may find it desirable to cut his general order into several job orders. He may order one man to cut the lumber of the right dimensions; another to cut the planks; another to build the steps; and each will require an order on the storekeeper for his supplies. These supplies will be acknowledged by the men receiving them, and on the stores ledger they will be credited to the accounts of the particular supplies given out. All these job orders, as well as the general orders, will bear the number of the original order from the superintendent, that is, C. E. 407. The men working upon these job orders will enter upon them, as soon as the work is completed, the number of hours spent. When, therefore, the job is done, a complete record is available, showing all stores used and all wages paid on account of this order. Excess stores returned are acknowledged and entered by the storekeeper on the stores ledger. In the office, the bookkeepers enter to the account of the order concerned, *i. e.*, C. E. 407, debits for stores issued and for labor, and credits for stores returned.

If the superintendent finds that in preparation for carrying out the original order for the steam-engine a machine must be repaired, he issues another order which we may call P. R. 2563. This will be interpreted to mean the 2563d order for plant repairs. This again may involve many materials from the stores department, drawings from the drafting department, patterns from the pattern department, castings from the foundry, finishing, setting up, and what not. In other words, many department orders and many job orders will be given and all will bear the original symbol, P. R. 2563. These, as in the case of the construction of equipment, will be carried through the various records, showing what total cost is to be charged to Repairs of Plant, or similar maintenance account.

If now the manufacture of the engine is ready to begin, the orders for it are given a symbol to indicate that the work is for outside business. We may call it in this case M. 423, meaning manufacturing order. This would be treated similarly to those already followed, except that in the end the charges would be made to Manufacturing.

Here, then, are the chief documents from which the office gets its information of prime cost. The principal books to which information from these documents is carried are as follows: first, the stores ledger, already described; second, a wages book (though often loose sheets of paper rather than a bound book are used for this purpose), showing the amount of credit to each workman for his time or piecework earnings; third, a cost book, arranged with ample space for each order, sometimes several pages being left blank at the beginning for the details likely to enter into the transaction before it is completed; fourth, the general books common to all business, such as a general journal, a cash book, a sales book, a purchase book, and finally a general ledger.

Let us now trace these orders through the books. All orders upon the storekeeper are entered in two places, — in the stores ledger and in the cost book. In the former, as we have seen, the supplies issued are credited: in the latter, the particular order is debited. Next, the wages item that has been entered on each job order is carried to two places, — the wages book and the cost book. In the wages book the particular workmen are credited each for his earnings. In the cost book each order is debited with its share of the wages expense. As a result, we now have entered on our books cost for wages and for material in respect to each order, and we also have credits for stores and for individual workmen's wages.

One other important matter is likely to remain. Many orders have connected with them some direct cash or other expense neither for labor nor for stores, — for example, telegraphing or traveling expenses. Such things also should go upon the cost book to make the record of cost as nearly complete as possible. They will be taken, of course, from whatever source will serve, — usually the cash book. Perhaps certain less obvious costs will pertain to certain orders. If, for instance, the construction of a machine involves risk of fire so great that special premiums must be paid on the factory during the work, the order should be debited for the extra insurance and general insurance account should be credited, so that at the end of the year the general insurance account will not be held responsible for the thing properly belonging to one specific bit of construction. If, again, the construction involves some peculiar process very much increasing the cost of repairs for any part of the plant, such loss



should be debited directly to the order and credited to Plant Repairs; for, as will be shown later, Plant Repairs should represent the indivisible costs as an element of "burden."

It is obvious that in the general ledger it is not necessary to keep account with specific orders, but only with classes of orders. These classes are likely to be most commonly as follows: Additions to Buildings, Repairs of Buildings, New Equipment, Repairs of Equipment, Office Conveniences, and Manufacturing. The work is much simplified, of course, when a separate cost book is kept for each class of order, and a separate column provided for wages and for stores. The total of each book is then the debit to the ledger account representing the class of order, and the total of the wages and of the stores columns is the credit to Wages and to Stores.

It may be well at this point to note two interesting auxiliary books. The "comparative cost register" is sometimes used to keep run of the comparative cost of making different lots of articles. If, for example, in June we make a dozen big induction coils and in February make a similar dozen, it is well to compare the cost in detail, especially if the work was done by different workmen or under different methods. In this register, the details of cost for the construction of both lots would be entered in parallel columns, possibly with the names of the workmen engaged. A comparison enables the manager to judge at a glance the relative efficiency of the work. This sort of thing would be worth while only for standard articles made rather often.

Another auxiliary book usually desirable to keep is the order ledger, in which are entered all the separate parts of the order, — sometimes not only the different department orders, but even the job orders under each. These may be checked off as fast as the slips are returned to the office for entry, so that at all times the condition of the order is recorded. If, also, the order is to be shipped in parts, a complete record of shipments should be kept for immediate reference. By this method it is possible to keep careful watch of the situation of each order; and, when contracts specify a time of delivery, this is a matter of great importance.

So far we have considered chiefly what is commonly called prime cost or direct cost, — that is, labor and materials. We must now approach the allocation of burden, or joint cost, — that is,

rent, insurance, taxes, interest, superintendence, administrative expenses, etc. The distribution of this burden may be made by any plan which will give a close approximation to the proportional benefit which each order has received from these different elements of cost; and the calculation will be very much simplified if we can by any method attach a number of these elements to one specific phase of production. It happens that a great many of these elements of burden are directly connected with the cost of using machinery. We may profitably, then, attach as many as possible of these elements to machine use. Then those that cannot be so attached must be allocated on another basis.

As this analysis proceeds, it may appear to those unfamiliar with this sort of thing that here is "great cry and little wool." The description of the process is perhaps more complicated than the process itself. Every year a larger number of manufacturing establishments are becoming convinced of the fact that the necessity for determining costs as exactly as possible is nowadays imperative. They employ at great expense expert accountants to analyze their businesses, to divide the different processes into smaller divisions, and to attach to each its specific expense, so that when a system is in active operation they can bid upon contracts with complete confidence in the margin of profit. It is only because competition has become intense in the last twenty years that this very large expense of organizing accounting has been thought worth while. The system described below cannot perhaps be said to exist in exactly this form in any factory. No attempt will be made to analyze expense in any factory to the last degree, but only to indicate the general principles upon which the work should be based. Some of the elements here introduced may be in many factories altogether insignificant. The distribution of burden here described is meant to be not a model but merely illustrative.

The more obvious of the costs connected with machinery are of four classes, as follows: first, those based on occupancy of space, which we will call space cost; second, those based on the cost of the machine itself, which we will call machine cost; third, those based on special expense connected with the machine when in operation (but not including power), which we will call machine-use cost; fourth, power cost. These are so clearly costs of the work of the

machines that no question can arise save as to the proportion in which each order receives benefit from them; and it is interesting to see that a very large part of the total burden to be distributed comes under one or more of these four classes.

The criterion for distributing burden over production on the basis of use of machinery is clearly time; for the same machine (when in proper repair) will always be capable of producing the same results. Even if the nature of a job requires lower speed, and loss is suffered, it is right that the loss should be charged to the order requiring such reduced speed rather than to the machine itself; for, so to speak, the loss is the fault of the job and not of the machine. We intend, therefore, to charge each job with cost in proportion to its time-use of the above four expenses for machinery.

Let us analyze these four classes of cost and see how they can attach themselves to the machines. The first, or space cost, will be a certain proportion, determined by the machine's occupancy of space, of the space cost of the entire establishment. For instance, there is a certain ground rent for the land occupied for the whole establishment, of which the machine shop in which this machine is placed receives a certain benefit. A certain portion of the ground rent, then, may be divided among all the machines in the machine shop in proportion to floor space occupied. This floor space, however, is not determined by the mere floor dimensions of the machine, but is the space necessary for its most successful operation, with room for operatives, for light, for feeding materials and delivering product, for passageways to and from it, etc. As a result of this subdivision, then, we find on account of space a burden of general cost which this machine must bear. The elements of that cost are usually several. First, interest on investment in land and buildings must be met (and this is clearly chargeable whether the company owns the land and buildings or not, for whether return is to be made to landlords, to lenders of capital, or to stockholders, the jobs must produce some means of meeting it).<sup>1</sup> Second, repairs

<sup>1</sup> There has been much discussion over the treatment of rent for concerns owning the real estate that they use. This has been based largely on the economic theory of rent, and no one can understand the discussion without an understanding of that theory. For practical purposes, however, the matter may be put briefly as follows:

Rent in the ordinary use of the word is composed of two elements: first, payment

to buildings are really a part of the costs of running the machines which they are built to house. Third, depreciation which repairs cannot prevent must be provided for. Fourth, taxes on land and buildings must be paid. Fifth, insurance on buildings must be provided. These five elements — interest, repairs, depreciation, taxes, insurance — we shall have occasion to mention often, for they arise in many connections, and we may therefore call them the five normal elements. Allied to these, though figured on a somewhat different basis, are two new elements, — heat (which must be charged not in proportion to floor occupancy, but in proportion to cubic occupancy, for that, of course, determines the amount of heat required), and light (which should be distributed not on the basis of floor

for exceptional advantages accruing to the owner of land or buildings because of location or other *natural* qualities — as exceptional shipping facilities or low power-cost; second, interest on the improvements made on the land, such as buildings. In the true economic sense, rent is only that part of the payment which is due to the exceptional facilities, as low power-cost. Obviously rent arising from such advantages is in one sense not cost at all, but a measure of gain, — it measures the saving by having the use of this special facility. Even though such economic rent is paid to another, it comes back in the saving. It is an outgo, but it is offset by a special income — or, what is the same thing, a reduced expense elsewhere. This has led to the theory that, at least for the manufacturing concern owning the land and buildings which it uses, rent need not be included in the schedules of cost.

The reply to this lies in the answer to the question, What is the purpose of keeping manufacturing accounts? Unless the accounting shows not only a basis of charges for manufactured goods, but also what are the gains from the conduct of business, it is not worthy of its name. If the concern pays rent, clearly the rent is a cost — as much as the payment for wages: in both cases an outgo is suffered in order that a return may be secured. If the concern is the owner of the property that it uses, two facts require that rent be charged as a cost. First, if the property is valuable enough to yield economic rent (*i. e.*, more than interest on the improvements on the land), it is so because it confers some advantage in lower costs, — as cheap power or low freights. If, then, rent is excluded from costs and the cost book shows only actual cost paid to outsiders by the business, prices based on the cost book give to the customer all the advantages of the cheap power or the low freight. Such prices are not normal and can never long continue. The only way to show the facts is to show that the cheapness of power or of freight is abnormal, and this can be done by entering rent as one of the costs. Second, the concern is in this case not merely engaged in manufacturing; it is a landholder, and as such it receives a landholder's revenue as distinguished from a manufacturer's revenue. An important purpose of accounting is to show different kinds or sources of revenue.

Theoretically it is well to distinguish between the pure economic rent and the return for capital spent on improvements; but in practice rent is usually figured as a simple percentage on the value of the real estate.

occupancy, but on the ratio which the number of artificial lights required by this machine bears to the total number required in the factory).

Some persons have objected to charging these things to machine cost on the ground that buildings, light, etc., are provided quite as much for operatives as for machines. Labor cost is recommended as a better basis for distributing this burden. The matter is of little consequence. All we are after in this case is a basis for distributing burden, and it makes little difference whether we use labor or machine cost. As a matter of fact, however, light, heat, and shelter cost as much for a boy working at fifty cents a day as for a man working at five dollars a day; and therefore the amount of wages is not so good a basis as the machine requirement.

Let us now see what are the elements of the second group of expenses, which we have called machine cost. These are simply the five normal elements (named above): interest, on the value of the machine itself; cost of repairs due to passage of time rather than to use (for the latter belongs in the next group); depreciation that repairs cannot prevent (especially obsolescence, or falling behind the times); taxes (this machine's proportion of the total taxes upon machinery); insurance (this machine's proportion of the total insurance on machinery). On four of these five normal elements no comment is necessary; depreciation will be considered later by itself.

The next group of expenses we have called machine-use cost. These are: first, the direct expenses of operation, such as for oil, cleaning, etc. (but not power, for that is joint and hence must be figured on a basis of its own); second, repairs due to wear and tear; third, depreciation (due to *use*) that repairs cannot overcome; fourth, superintendence; fifth, the five normal elements — interest, repairs, depreciation, insurance, and taxes — on any special tools which may be required in connection with this machine but are not included in the cost of the machine itself. The last item is included here because the tools, always kept with the machine, would not be included in the valuation of tools in the tool room. When the machine is abandoned, however, they become free. Hence they belong not with machine cost, but with machine-use cost. The superintendence item sometimes could be more wisely

put elsewhere. Our purpose is, as has been already suggested, to attach as many as possible of the elements of burden to particular machines, for this simplifies our task. Superintendence is bound to be a part of the burden in any case, for it cannot be a prime cost. If, then, in one operating room with a dozen machines of one type, at one cost, we have one foreman in charge, his wages may be debited directly here to each machine as one twelfth of his total wages. When, on the other hand, a foreman is in charge of a room containing many machines of different types and of different costs, it would be practically impossible to say what proportion should be charged to each machine. Consequently, our item of superintendence should or should not be included here according to circumstances. If not here it must be introduced elsewhere in the burden to be distributed otherwise. Often it would not be worth while to divide repairs and depreciation between machine cost and machine-use cost. Since machines often become obsolete before they wear out, depreciation could be charged as machine cost and repairs as machine-use cost.

Our last group is power cost. The determination of the proportion which should be attached to each machine must be based upon many figures, but in principle it is very simple. The power establishment is itself subject to three of the four groups of charges that we have already connected with the other machines, that is, space cost, machine cost, machine-use cost; for the power plant is responsible for its share of the ground rent of the whole establishment, for the five normal elements upon its own building, for its light, for the five normal elements upon its own machinery, and for its special use costs. These would be figured as for the other machinery; but they would include a greater number of items, — that is, the five normal elements on all shafting, belting, pulleys, and other things used in the transmission of power (other than those things already included in the figures for specific machines), and the specific cost of running the power plant, as fuel, water, wages of engineers and firemen, and supplies. These figures give us the total cost of supplying power to the machine shop. The cost for any particular machine is very clearly its proportion of power consumption, determined by the ratio which the horse power required by it bears to the total horse power of the plant.

This completes, roughly, the list of things of which the cost can be applied directly to particular machines. These four groups of cost — space cost, machine cost, machine-use cost, and power cost — are the total costs of running the machinery. This total for each machine divided by the number of working hours in a year gives what is commonly called the “machine hour-rate.” Some allowance is always made, of course, for necessary idleness of all machines, such as for repairs, oiling, cleaning, etc. We may say roughly, for a mere working hypothesis here, that 2700 hours per year, 9 hours per day for 300 days, is the working time. Every machine in the shop has its symbol or number and has attached a tag giving its hour-rate. Since all work performed upon it is done by the authority of a job order, it is a simple thing for the operator when reporting his own time to report also the time of the machine which he has used. This gives a figure of machine cost to be debited to each job order; and it covers all the burden which we have been able to attach to the use of machinery.

Our determination of cost in connection with machinery has so far been on the assumption that all machinery is driven full time. Theoretically, no machine should ever lie idle, except for repairs, oiling, cleaning, etc., for machines should be put into a shop in such proportion that they shall keep each other busy all the time. Practically, however, this is impossible except for shops of very large size. It may chance, for instance, that on some work one planer can keep up with three drills, and that on other work one drill can keep up with three planers. Indeed, the work of the shop may be constantly such that one planer can keep up with three drills, and yet only one drill is needed for the amount of business done. Since it is not possible to economize by buying planers in correct proportion, that is, one third of a planer, two thirds idle time on that machine must be constantly suffered. It is obvious, then, that idle time is so far a matter of importance that it may throw entirely out of usefulness our calculation of machine rate at 2700 hours per year, and therefore must be introduced in many cases as a new element. It is deserving of careful study.

The chances of unknown waste in factory administration are alarming and the purpose of cost accounting is quite as much to forestall them as to determine actual cost. Four classes of waste

are obvious, — in material, in labor, in machinery time, and in power. Only one of these, in material, is of the obvious sort that can be watched by mere commonplace methods. The stores ledger is one means of accomplishing this. Whenever for an hour any one of the other three expenditures is in excess of what can be utilized, loss is suffered; and the arrangement of facilities and work should be such that each is available in exactly the strength that the others can use. The amount of power needed is dependent upon the number and kind of machines in use, and that is dependent not merely upon the kind of business and the installation of machinery, but upon the number of laborers and their efficiency. The maximum utilized power which should be a factor in determining our machine rate may be fixed, then, by any one of three things, and which of the three will be operative will depend upon circumstances. Clearly, the absolute maximum is the strength of the power plant. Below that may be the maximum consumption of power by the machines installed. Below that, again, may be the maximum consumption by the machines which the supply of labor makes it possible to use. In the first case, the engineer develops all the power he can get. In the second case, he should develop a power equal only to the known maximum consumption by all the machines installed. In the third case, he should develop a lower power indicated to him by the superintendent on the basis of the number or class of men employed. In calculating our machine rate, it makes a great difference which of these three maxima of power we use as the total of the shop. If, for example, our installation of machinery could use 150 horse power and the total capacity of the power plant is 100, we are committing an absurdity if we fix each machine's power cost at its proportion of 150, for 150 is never produced. In such a case 100 must be the basis. Clearly, moreover, not all machines under these conditions can have full use: some even at the maximum demand must go on partial idle time. Again, though the power be 200 and the maximum consumption 150, if labor is scarce or slow, some idle machine time must be suffered. The machine rate must be based not on an arbitrary figure, but on the total power utilized each day. To provide for this is not so difficult as might at first appear, for the total power used does not vary much from day to day. It may vary from season to season; but, though to readjust the calculation of



machine rate for daily changes would be a considerable task, occasional adjustment is not a severe task, and most calculations will last for many weeks or months. A sliding scale may be easily constructed so that a word from the superintendent indicating the horse power for the day will show what rate to use for each machine.

Our problem now is the proper treatment to give idle machine time, for we have seen this to be common and even unavoidable. The answer to our problem may depend in part upon the condition of competition. Clearly, if the small plant requiring but one planer and one drill, although the one drill might as well serve with three planers if the business were larger, is to compete on even terms with a large plant where a drill is run full time, the small plant is wasting two thirds of the expense of this drill, and cannot charge the loss to the job but must take it out of profits. On the other hand, if a shop can get business independent of competition, because of the demand for such a shop in the community, it may both properly and practically charge to the job loss from the idleness of its drill. Here, then, are two different practical treatments of cost for the same work, each necessary in its own case. In one case, since the competing concern can do the work, the drill in the small shop is not a community need, but simply a cost of getting business for the small shop, and idle time must come out of its profits. In the other case, since a requirement of the community is that a drill be maintained, the jobs needing the use of a drill must pay for its cost, and a part of that cost is idle time. So in the case of competition the machine rate should be figured on the basis of full capacity, say 2700 hours per year; that is, the total cost for the machine must be divided by 2700 to find the hour-rate, for the competing concern, able to use its drill 2700 hours per year, includes in its cost a rate based on full time and the competition must be met. In the non-competitive case, however, the total machine cost need be divided by only 900 to find the hour-rate — making the few jobs pay for idle time.

What ought the books to show? What does a manager wish to know about this matter of idle time? In either case, competition or quasi monopoly, it is desirable that the idle time be reduced to a minimum. The most effective stimulus for reducing any waste is to show that it cost something. So even if the cost of idle time cannot be charged to the order, good accounting demands that it shall be

shown. When such a record is kept, any improvement in the planning of work or in the size of the business, so as to require more drilling, will show a decreased idle-time account and consequent increased profit. If the books failed to show such a saving, the purpose of accounting would so far fail. Possibly some work can be got, to be done at odd times, which will pay for the otherwise idle time of the machines and meet all direct costs, though not contributing anything to the general burden. Such work would be worth while, like some railroad traffic discussed in Chapter X. It could not be safely taken, however, unless the cost of this idle time were known.

Let us see how the record may be made complete. Every job order returned shows the machine rate and the time, as we have already seen. The only machine rate we have so far figured is based on full time. Now we have seen that when there is partial time there may be two prices for the same work, — one a competitive price, based on full time and involving loss of the idle time, and the other the quasi monopoly price, based on partial time and forcing the customer to pay for idle time. The actual cost is the same in either case. Some accountants urge that the machine rate be figured at partial time; that is, if the probable maximum use is one third, the machine rate should be figured as if 900 hours per year were the maximum use for the machine. This charges the cost of idle time to the order, making each order responsible for thrice the actual time. The objection to this is that in the competitive market prices cannot be based on the cost as shown by the books, for since the machine cost has been figured at three times the competitor's figure, by so much the chance of getting an order at that price is injured. A discount must be made for the idle time that competition prevents charging to the customer. In other words, though the cost book ought to be the basis for making prices, it has been kept in such fashion that it cannot be used in competitive conditions. This method, moreover, hides the idle-time cost by treating it as if it were full time, and the gain or loss of altered conditions cannot be determined. Other accountants urge that all machine rates be figured on a full-time basis and idle time account be charged for waste. The objection to this method is that, although it preserves total loss on the books and is so far good, enabling one to discover an improvement in the conditions, it fails to show the actual cost of work on the partial-time basis, —

a cost which not only should be shown, but can with a quasi monopoly be put upon the customer to pay. As a matter of fact, there is no reason why one may not practice both methods, with little more work than with either alone, and get the advantages of both.

Both plans mentioned above include a machine ledger, which has a space for each machine and records its time under three heads, occupied, running, and idle. It is noteworthy that a machine may be occupied on a job when not running, for making adjustments and setting up work preparatory to a job sometimes takes longer even than the job itself. This is particularly noticeable in the case of complicated patterns of cloth, where it may take a day or two to set the machine to produce cloth which will be completed in one day's running time. It is clearly necessary, then, under any plan, to distinguish between occupancy and running time, for a job must pay for occupancy on two of our four groups of cost, that is, on space cost and on machine cost, but it need pay for machine-use cost and power cost only when actually running. The job order slips will show the occupied time and the running time. The idle time is, of course, simply the difference between the occupied time and the maximum, and need not be figured for the machine ledger day by day, but only at convenient intervals. At what rates shall these various times be debited to the orders? We can get all the information desired with but three figures for machines not driven full capacity. These are rate not running, additional rate when running, and the ratio of estimated idle time to occupied time. Occupancy cost and idle cost are, of course, the same; that is, the two elements of space cost and machine cost. Cost when running, on the other hand, is greater than these by the two elements of machine-use cost and power cost. If we know, in addition, the ratio of idle time to occupied time, we can distribute idle time to orders at will. Whether the condition is one of keen competition or one of quasi monopoly, a job actually costs idle time for its proportion of the total idle time of the machine. This cost should appear on our cost book in a way which makes it easily distinguishable, — so that we may omit it in estimating prices to meet competition of plants running full time, may include it where the demand of the community enables us to charge the idle time to the job, and may know in either case how much could be saved by conditions that would prevent idle time. Let us divide

the common machine rate into two rates, minimum rate (rate not running) and additional rate (extra cost of running). The machine ledger might look somewhat as follows, omitting items not serviceable in this connection:

				Machine # 76				Horse power —		
								Idle time $\frac{2}{3}$ (May 1, 1908)		
								Minimum rate .0334		
								Additional rate .0431 (May 1, 1908)		
Date	Occupied time	Rate	Amount	Idle time	Rate	Amount	Running time	Add. Rate	Amount	
Nov. 18	7 hr. 30 min.	.0334	.25	1 hr. 30 min.	.0334	.05	6 hr. 30 min.	.0431	.27	

We may now carry to the cost book the figures taken from the same order slips, as follows:

Minimum rate, # 76, 7 h. 30 min., @ .0334	.25
Idle time, twice above figure	.50
Additional rate, 6 h. 30 min., @ .0431	<u>.27</u>

1.02

It will be noted that though on the machine ledger idle time was entered at \$.05, it was charged on the order at \$.50. The discrepancy is due to the fact that the day is not an average day. To say that the machine is idle two thirds of the time is not to say that it is idle six hours each day. The cost of idleness must be distributed to orders not according to the actual idleness while each order is in progress, but on the basis of an average of the year.

We may now observe the effect of these entries. It is desirable to keep ledger accounts to represent each of the many elements of burden, and some of these will overlap, for we wish to correlate some individually and others in groups. For example, we wish to keep an account for fuel so that we may compare different years; but we also wish to keep total power cost, which includes fuel. We wish, again, to see how the total charges through the year to Manufacturing for machine-use cost and for power cost compare at the end of the year with the actual expenditures on these counts, — for only by doing so can we tell whether our estimates are sufficiently accurate; and yet these include power, which in turn includes fuel. We must arrange our accounts, therefore, so that we may use several sorts of combinations. It is not necessary here to cover the whole field, but the principle can be easily illustrated from the items already used. Let us see what ledger accounts are affected by the machine-ledger entry and the cost-book entry just given. We have used three

rates for machinery, — the machine rate (including all costs for machinery used all the time), the minimum rate (non-running cost for machinery idle part of the time), and the additional rate (machine-use cost and power cost for machinery idle part of the time). It is possible to carry the analysis of results a little further by dividing the machine rate for machines running all the time, as well as for the others, into minimum rate and additional rate. Though this makes a little more work (two rates and totals daily instead of one), it enables us more closely to compare estimated costs through the year with actual expenditures as shown at the end of the year; for we have two groups of items to compare instead of one, and hence a discrepancy can be more easily identified. We will assume here, then, that on the general ledger two accounts are kept to represent all charges to orders on account of machinery burden — Minimum Rates and Additional Rates. The entry of our cost book, given above, must be posted, therefore, either through the journal in summaries or direct from the cost book in totals, so as to result as follows:

Manufacturing	1.02	
To Minimum Rates		.25
Idle Time		.50
Additional Rates		.27

Such treatment shows that manufacturing cost is responsible for \$1.02 conferred by the three credited elements.

These elements, in their turn, must be debited at the end of each year, or oftener, for the cost which enabled them to serve Manufacturing. Additional Rates, for example, will be debited for the various items of machine-use cost and power cost, such as oil and fuel. The difference between the debits and the credits shows by how much the distribution of burden to orders, on these counts, has failed to meet actual expenditure or has exceeded it. Such balance, which should be small, may be carried to Manufacturing, — or to Burden Adjustments, which should be ultimately closed into Manufacturing. This Burden Adjustments will roughly indicate what changes to make for the new year in the specific rates. The second of these three credited accounts, Idle Time, presents a somewhat different case. No direct distinguishable items can be charged to it, for its expenses are exactly the same as those of Minimum Rates, —

that is, space cost and machine cost. Indeed, if all such costs are debited directly to Minimum Rates, and then that account is credited by the allowance for idle time, the exact situation will be represented. This transfer must be made by debiting Idle Time and crediting Minimum Rates not for the amounts charged to orders on the cost book, but for actual idleness shown on the machine ledger. Then, since the debit to Idle Time will show cost of idleness and the credit will show how much was distributed to orders, the difference will show how accurate was the estimate of idle time — for both were figured at the same rate. The balance may be transferred to an adjustment account, or directly to Manufacturing. The account for minimum rates will then bear its proper charges, and, when credited as above for the charges to orders, the balance will show how correct were the calculations of rate. This balance, like the balances of the other accounts, will be closed to an adjustment account, or directly to Manufacturing.

We may summarize the treatment of burden up to this point as follows: as far as burden may be attached to the use of machinery, it is distributed among orders on a carefully apportioned series of rates, — for occupied time, for running time, and for idle time; and at the end of the year the actual costs are compared with the yield of these rates, and adjustments are made. These accounts are by this process closed without a balance at the end of the year, and the total expense which they indicate is carried to Manufacturing, where it joins the prime costs of labor and materials. Everything may be carefully watched.

Before going on, it is well to note that this sort of plan is subject to an infinite number of variations without interference with the principles. For example, we have assumed above that machine rate is divided for all machines into two parts. When that is not done, Machine Rates would be credited for all earnings of full-time machines, Minimum Rates and Additional Rates for partial-time machinery would be closed into Machine Rates, crediting it at the end of the year, all costs connected with machinery would be debited to that account, and actual idle time would be credited to it. Again, the five normal elements of cost on tools attached to machines were included above in machine-use cost. When, however, such tools are attached to particular machines rather than to a group of ma-

chines, they would lie idle when the machines were idle, and then their cost must be included not in machine-use cost, but in machine cost. No plan can stand alone: the best must be adapted to circumstances; and adaptation to concrete cases, when the ground is once laid, is far simpler than this complicated abstract exposition can indicate.

We have still remaining several elements of manufacturing burden not connected with machinery: such as freight, cartage, storage, etc., connected with materials; superintendence, etc., connected with labor; and general administration. These are practically all capable of distribution on a percentage plan; an exception, if any, is in freight and cartage, for these are for various classes of goods from various distances. Usually the difference in rate and distance is not so great as to make necessary the figuring of freight and cartage on each particular lot. When desirable, however, it may be entered by items in the record of cost on the stores ledger and in the total of stores account in the general ledger. Otherwise, for joint costs on material, the elements are as follows:

Freight

Carting

Storehouse space cost, including ground rent and the five normal elements on the building, and ground rent on storage yards

Storehouse wages

Storehouse supplies consumed, such as cord and twine, oil, stationery

The five normal elements (except repairs) on the average stores (and this can be easily determined by taking as a basis the stores limit plus a certain percentage of the standard order)

The total of this list gives us the joint stores or material expenses, which when divided by the total stores used gives the percentage to add to the cost of material for each order.

The expense of superintendence may be distributed on a similar plan, as a certain percentage to be added to the labor cost for each order.

General expenses of administration may be easily divided down through the various departments as far as the conditions warrant. For example, in some departments the administration expenses are likely to be a heavy percentage of the output, and such departments

should suffer correspondingly heavy charges. In any case, the total administrative expenses for the department should be divided by the other expenses for the department, and the result, which is the percentage that administration bears to other expenses, should be applied to the expenses of each individual order and the result added as one of its costs. These charges to Manufacturing may be credited to Administration, and at the end of the year adjustment may be made for discrepancy as in the cases mentioned above. Similarly, general manufacturing expenses not incidental to any particular department, such as interest on work in process of manufacture, and a part (the rest to be borne by the selling establishment) of the wages of general officers, of office space cost, of office employees, of office supplies, etc., would be determined as a percentage and added to each order. These two divisions of administrative expense, departmental and general, would in practice be combined. For example, if such general expenses are 3% and such departmental expenses are for Department A 10% and for Department B 5%, the cost books would show simply 13% added to all work done in Department A and 8% to all work done in Department B.

The disposition of all these costs on the general books is similar to that of the costs already shown in connection with machinery: that is, each account representing one of these elements of burden is closed into an account representing the group, and then the group account is closed into Manufacturing. For example, Storehouse Wages is debited to Stores Costs. Stores Costs is credited and Manufacturing is debited for the amount charged to individual orders. The balance of Stores Costs shows how much is the inaccuracy of the calculation.

We may now arrange our costs up to this point in summary form.

Prime costs		{ Stores
		{ Wages
Burden	{ Machinery costs	{ Minimum rates
		{ Idle time
		{ Additional rates
	{ Secondary costs	{ Stores costs
		{ Superintendence
	{ Administration	{ Departmental expenses
{ General expenses		



Now let us note how simply in practice these items may be applied to each order. Our rates and percentages, it will be remembered, are general, figured once for all or annually or semi-occasionally. The task of entering indirect costs for each order is applying known rates and percentages to specific cases. The entries for cost of an individual order, then, are as follows (the figures used are arbitrary to show treatment only):

Stores (from order slips)	100		
Stores costs (% of above)	<u>10</u>	110	
Wages (from order slips)	30		
Superintendence (% of above)	<u>1</u>	31	
Minimum rates (from order slips)	5		
Idle time " " "	7		
Additional rates " " "	<u>10</u>	<u>22</u>	163
Department and general expenses (% of total above)			<u>2</u>
			165

We must note, too, that practically all these costs are accurate within certain limits. The prime costs should be exact. The total of the joint costs may be ascertained as often as desired; and the only thing left to mere estimate is the proportionate amount of such joint costs which is to be borne by each order, — but that is so carefully worked out that the approximation to exactness is sure to be very close.

Before passing on, it is well to note that our discussion of manufacturing cost has not included quite all items. Nothing has been said of standard drawings, standard patterns, standard flasks, cranes, general tools, or a thousand and one miscellaneous items. These present no difficulty, however; for each, in its own circumstances, must fall in with some part of the plan already outlined or give an additional step on the same principles. In general the expense for them is the five normal elements (figured, except for repairs, on their cost), and this can easily be added to machinery costs or to secondary costs, as circumstances may warrant.

We may now turn to the costs of selling. It has already been suggested that selling cost and manufacturing cost must be clearly distinguished, so that a change in either manufacturing conditions or sales conditions may be registered. If there is any confusion of

manufacturing and selling costs, the books by so much fail to show the results of change.

The first question to arise is whether the sales division shall be debited for goods at the cost to the manufacturing division, or at a somewhat larger figure, — allowing the manufacturing division to claim a profit. The argument for allowing profit to the manufacturing division is that since better economy will be registered in a greater amount of profit, the inducement to enforce better economy will be great. There are, however, but two methods by which the manufacturing division may be allowed a profit. One of these is by allowing as profit an arbitrary percentage on cost. This obviously will not register economies, for the cost is itself the basis of the profit. The other of these methods is to allow to the manufacturing division as profit any amount by which it can reduce cost below an arbitrary figure. Under this plan if there has been a reduction in wages or in the price of raw material, by so much is the economy shown by the figure of profit misrepresented; and, therefore, the plan fails in its specific aim. When labor or raw material has become more expensive, on the other hand, this plan seems to blame the manufacturing management. By this method, moreover, the labor of preserving cost has been largely thrown away, for it assumes as cost for selling purposes a figure that bears no relation to the cost books. The only possible method of measuring comparative economy is comparing actual costs in different years, allowing for difference in effective wages and raw material. This the comparative cost register and the ordinary cost books make possible. Since such comparison is possible directly from the books, the effort to find a measure of economy in the profits of the manufacturing division is mere wasted energy, — and sometimes, as we have seen, worse than that, for it may misrepresent the facts. Finally, to handicap the sales division, by charging it arbitrary prices, is hardly fair in competition with other establishments where this is not the practice. The conclusion is that the selling division should be debited for all goods at exact cost to the manufacturing division.

Though the main elements of selling cost are obvious, some are likely to be forgotten without special attention. First, almost all large establishments are obliged in the dull seasons to accumulate stock ready for the demand of the active seasons. We have, there-

fore, interest, insurance, depreciation, and taxes, to figure on this accumulated stock. This is not exactly manufacturing cost, for the manufacturing division cannot always make goods at the variable rate of the demands of the seasons. It must produce them when it can. It is, however, the task of the selling division to keep goods moving as rapidly as possible, and to find such inducements as may be worth while to get them out of the warehouse in the dull season. The most effective stimulus to the selling division for keeping the warehouse clear is to debit this division with the cost of accumulating the stored stock. Though this may sometimes seem a hardship, it is unavoidable; for charging to manufacturing would to some extent nullify the careful cost-keeping, especially in the matter of comparative costs. Some overlapping of function is bound to occur between the manufacturing and the selling division, and that is just why need exists for a general manager, whose expenses are divided between the two divisions. It is the manager's task to determine how far it is cheaper for the manufacturing division to accommodate itself to the varying demands of the seasons, and how far the task of accommodation shall be laid on the selling division. Whatever cost of this sort is incurred, however, seems properly to belong to the selling division.

Another selling cost likely to be forgotten is that of the estimating department. In many lines of activity a great deal of money is spent in submitting estimates and proposals for work, even involving elaborate specifications and plans, but resulting in no business. This is as much a part of selling expense as are the expenses of traveling men, and should be kept in an account by themselves, not chargeable to particular jobs but to selling costs in general.

Some production, of course, will have no selling cost to follow. For example, we saw early in this chapter that in the factory which we were discussing there might be certain orders for construction of equipment and for plant repairs. Since these were for internal use they were independent of selling costs, and must be omitted in the distribution of selling costs over product.

The more obvious selling costs remaining are: sales division space cost, — that is to say, its proportion of ground rent, the five normal elements (which we have followed all the way through), with heating and lighting, for the buildings occupied by that division; salaries of

the officers; correspondence, bookkeeping, etc.; traveling salesmen's salaries and expenses; and advertising. These expenses may, however, apply sometimes more strictly to some articles than to others. For example, if any article has not been advertised for years and continues to sell on its reputation, but slight advertising expense should be charged to its cost. Perhaps a small charge of the advertising expense should be borne even by this article, for the general advertising keeps up the reputation of the firm and therefore this particular article receives its share of the benefit. If, again, some exhibition is given at a fair in which only a few articles are shown, the cost of that exhibition should be charged chiefly to those articles, — not all, however, for, as in the case above, the general improved fame of the business has probably sold other articles. It is worth while to note, too, that some advertising costs may not be exhausted in the year of occurrence. An advertising campaign may have a duration of several months or even years, and at its close a large item of resource may remain in a form similar to "good will." Certainly in a merger this would have to be acknowledged, and in any case it may be counted as an asset, reducing by so much the share of advertising borne by the year in question.

In ultimate allocation of selling cost, then, certain special costs will be assigned to certain classes of sales, and then the remaining selling costs will be distributed among the various orders on a percentage basis. Since all special costs attributed to one class of articles are an exemption for the others, the special costs are assigned first, and then the general costs distributed to all. That is to say, the total general selling cost is divided by the total manufacturing cost, so as to show the percentage. This is then distributed among the several orders or kinds of production on a basis of their manufacturing cost as previously determined.

We have finally, then, for every article manufactured, the following summary:

Producing Cost	{ Prime Cost Burden
Selling Cost	{ Special General

The total of these figures gives us what we set out to find, — cost of making and selling, a cost below which the price cannot go without causing the article to fail to bear its share of the cost of running the establishment. Of this total cost, the prime cost and the machine rates, since they are different for different articles, must be treated individually and will usually appear on the principal books; but the percentages, which are uniform for whole classes of goods, may be applied to individual orders outside the principal books. Consequently the full detailed costs are likely to appear not on the books proper, but on cards or sheets, arranged for ready reference. These may be either in a summary form, like that last given, or, preferably, in a form like that on page 239 with selling costs added.

It will have been observed, of course, that not all kinds of manufacturing are susceptible of this sort of complete accounting. The type which we chose for illustration was simple, that is, the manufacture of goods chiefly on orders or the manufacture of certain standard articles of various kinds. Consequently the cost of each step in the manufacturing process could be traced, because practically each step was an entity. Where small articles are manufactured in large quantities, with most of the product of one type, the cost is to far greater extent joint than that which we have so far discussed; and, by so much, it is more difficult to analyze. Always, however, cost should be analyzed as far down as the method of production will allow. In a textile mill, for example, almost all cost is joint, because many machines are at work producing the same sort of thing, and it is impossible to trace the various steps in the process for each part of the product. If careful statistics are kept, however, it is always possible to determine averages: that is to say, the records should show materials consumed, the wages paid, and the product manufactured in each department of the business. So far as the thing is possible, a textile manufacturer should determine not only the average cost of each piece of goods of each kind, but even the average cost of each piece of goods of each pattern. There is a limit, of course, beyond which this thing cannot go; but it is usually surprising to find how much it is possible to save at a little expense for accounting.

It has not been thought worth while in a book of this sort to deal with the details of keeping the subsidiary records, such as methods

of keeping account of stores on hand and consumed, labor, time, etc., for these things are necessarily different in different factories, — not only because of the varying personalities of people in charge, but because of the varying conditions under which any principles must be carried out. It is enough here to indicate the principles themselves.

We are now concerned with the matter of determining profits. In most lines of business an account of stock is essential to any determining of profit, but here we have been singularly fortunate in being able to identify our cost with our product at every step. The manufacturing account, as indicated by the books, includes the cost of all unfinished as well as finished products in the factory. If, then, whenever any goods are taken from the shop they are credited to Manufacturing and debited to Stock at cost, the balance of Manufacturing at all times will show the cost of unfinished goods in the shop. If now, when goods are removed from the warehouse and shipped from the establishment, Stock is credited at cost, Stock can show neither profit nor loss, because debits and credits are at the same figure, but its balance will show always the cost of finished goods on hand in the warehouse. Finally, if, when goods are shipped and Stock is credited, Sales, or Trading, is debited for cost, as has already been shown advisable, and then, when buyers are debited in the sales book, Sales, or Trading, is credited for selling price, the balance of the trading account indicates gross profit, — that is, the difference between manufacturing cost and the price received. If selling costs are then debited to Sales, the balance becomes net profit.

It is worth while to note how complete is this system with regard to assets in the form of material, unfinished work, and finished stock. As we saw long ago, the balance of Stores, both in the stores ledger and in the general ledger, indicates the value of stores on hand, — that is, it is a pure resource account. The balance of Manufacturing, again, shows the cost of unfinished work on hand, and is also a pure resource account. The balance of Stock shows the cost of finished work on hand, and is a pure resource account. The balance of Sales shows net profit on goods sold, that is, it is a nominal account showing profits, — the resources being registered in cash, notes, accounts receivable, etc., which resulted from the sales.

It will be observed that under this plan no profit is allowed for unfinished work on hand. On general principles, unfinished work should be counted as an asset for cost only. An element of all natural contracts is a certain degree of risk, and that risk may involve loss at almost any stage of the proceeding. Until the work is done and accepted, therefore, the profits are merely on paper. The work done, however, unless already costing more than the contract price, is a full asset, for it will count toward the final accomplishment required by the contract. On important contracts nearly completed, when large profits are in sight, this plan seems to result in an inaccurate distribution of profits between two years; and it would certainly be unfair if a partnership that had conducted the work were to be dissolved just before completion of the contract. This is one of the cases in which common sense is a better accounting principle than any rule or formula. Similar unusual conditions may at any time lead to a departure from general principles. Of course if a part of the work is known to be wasted, so that the contract will result in loss, that part should be written off.

This long explanation of method may be made clearer by a summary of the ledger as it would stand after the accounts had been closed. No attempt is made in the summary below to give a comprehensive view; but enough is shown of each sort of account to indicate the principle not only of the detailed cost-keeping (except for individual orders), but also of the combinations into groups, the comparison of estimates with results, and the final disappearance of all but leading totals for the income sheet. The detailed costs for particular orders, it will be remembered, are shown on the special cost books, from which are posted (directly or indirectly) the credits to Labor, to Stores, to Minimum Rates, to Additional Rates, and to Idle Time, with the corresponding debits to Manufacturing (or Plant Repairs, Building Repairs, etc.). It will be noted that some of the entries here shown need be made only weekly, and many are required only at long intervals (annually, semiannually, or quarterly), and therefore the method is not so burdensome as the illustration may suggest.

The figures used below are arbitrary and are intended merely to show the relations of the different accounts; they may be called units, or dollars, or thousands of dollars, indifferently. The accounts are

arranged in the order in which they can probably be most conveniently closed. The closing of many accounts cannot be accomplished until many other accounts have been in part closed into them; and so the order in which the accounts are closed is of great importance. For example, to take an extreme case, since Administration must bear a portion of space cost, Space Cost must be closed first; but since space cost is dependent in part on building repairs, Building Repairs must be closed still earlier; theoretically, too, building repairs should bear a portion of administrative expense; and we then have a vicious circle, each depending on the others. As a matter of fact, however, since the portion of administrative expense chargeable to Building Repairs is small, it may be disregarded or taken arbitrarily in advance of the closing of Administration.

x

## PAY ROLL

Cash	1200	Cartage	5
		Building Repairs	20
		Stores	5
		Superintendence	20
		Plant Repairs	22
		Administration	15
		Power	25
		Manufacturing <sup>1</sup>	983
		Estimating	5
		Selling	100
	<u>1200</u>		<u>1200</u>
	<u><u>1200</u></u>		<u><u>1200</u></u>

## FREIGHT

Cash	<u>75</u>	Stores	<u>75</u>
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## CARTAGE

Pay Roll	<u>5</u>	Stores	<u>5</u>
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RENT<sup>2</sup>

Loss and Gain	<u>200</u>	Space Cost	<u>200</u>
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FUEL

Cash	110	Lighting	5
		Heating	10
		Power	<u>95</u>
	<u>110</u>		<u>110</u>
	<u><u>110</u></u>		<u><u>110</u></u>

LIGHTING

Fuel	<u>5</u>	Space Cost	<u>5</u>
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HEATING

Fuel	<u>10</u>	Space Cost	<u>10</u>
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BUILDING REPAIRS

Pay Roll	20	Space Cost	50
Stores	25		
Superintendence	4		
Administration	<u>1</u>		
	<u>50</u>		<u>50</u>
	<u><u>50</u></u>		<u><u>50</u></u>

DEPRECIATION

Buildings	60	Space Cost	55
Machinery	111	Minimum Rates	105
		Power	<u>11</u>
	<u>171</u>		<u>171</u>
	<u><u>171</u></u>		<u><u>171</u></u>

TAXES

Cash	26	Space Cost	10
		Minimum Rates	15
		Power	<u>1</u>
	<u>26</u>		<u>26</u>
	<u><u>26</u></u>		<u><u>26</u></u>

INSURANCE

Cash	47	Space Cost	20
		Minimum Rates	25
		Power	<u>2</u>
	<u>47</u>		<u>47</u>
	<u><u>47</u></u>		<u><u>47</u></u>

## ACCOUNTS

	SPACE	COST	
Rent	200	Stores	15
Lighting	5	Minimum Rates	275
Heating	10	Superintendence	9
Building Repairs	50	Administration	11
Depreciation	55	Power	15
Taxes	10	Selling	25
Insurance	<u>20</u>		
	<u>350</u>		<u>350</u>

STORES<sup>3</sup>

Cash	1000	Building Repairs	25
Pay Roll	5	Plant Repairs	20
Freight	75	Power	5
Cartage	5	Manufacturing <sup>1</sup>	1050
Space Cost	<u>15</u>		
	<u>1100</u>		<u>1100</u>

## INTEREST

<i>Loss and Gain</i>	315	Minimum Rates	300
	<u>—</u>	Power	15
	<u>315</u>		<u>315</u>

## SUPERINTENDENCE

Pay Roll	20	Building Repairs	4
Space Cost	9	Minimum Rates	5
	<u>—</u>	Plant Repairs	5
	<u>29</u>	Additional Rates	15
	<u>—</u>		<u>29</u>

## MINIMUM RATES

Depreciation	105	Idle Time	125
Taxes	15	Manufacturing <sup>1</sup>	598
Insurance	25	Burden Adjustments <sup>4</sup>	2
Space Cost	275		
Interest	300		
Superintendence	<u>5</u>		<u>—</u>
	<u>725</u>		<u>725</u>

PLANT REPAIRS

Pay Roll	22	Power	2
Stores	20	Additional Rates	48
Superintendence	5		
Administration	<u>3</u>		
	<u>50</u>		<u>50</u>

OIL

Cash	5	Power	3
		Additional Rates	<u>2</u>
	<u>5</u>		<u>5</u>

GENERAL EXPENSES <sup>5</sup>

Cash	<u>30</u>	Administration	<u>30</u>
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ADMINISTRATION

Pay Roll	15	Building Repairs	1
Space Cost	11	Plant Repairs	3
General Expenses	30	Power	1
		Manufacturing	40
		Selling	<u>11</u>
	<u>56</u>		<u>56</u>

POWER

Pay Roll	25	Additional Rates	175
Fuel	95		
Depreciation	11		
Taxes	1		
Insurance	2		
Space Cost	15		
Stores	5		
Interest	15		
Plant Repairs	2		
Oil	3		
Administration	<u>1</u>		
	<u>175</u>		<u>175</u>

## ACCOUNTS

## ADDITIONAL RATES

Superintendence	15	Manufacturing <sup>1</sup>	243
Plant Repairs	48		
Oil	2		
Power	175		
Burden Adjustments <sup>4</sup>	<u>3</u>		
	<u>243</u>		<u>243</u>

## IDLE TIME

Minimum Rates	125	Manufacturing <sup>1</sup>	123
	<u>      </u>	Burden Adjustments <sup>4</sup>	<u>2</u>
	<u>125</u>		<u>125</u>

## MANUFACTURING

Pay Roll	983	Stock	3,038
Stores	1,050		
Minimum Rates	598		
Administration	40		
Additional Rates	243		
Idle Time	123		
Burden Adjustments	<u>1</u>		
	<u>3,038</u>		<u>3,038</u>

## BURDEN ADJUSTMENTS

Minimum Rates	2	Additional Rates	3
Idle Time	<u>2</u>	Manufacturing <sup>4</sup>	<u>1</u>
	<u>4</u>		<u>4</u>

## STOCK

Manufacturing	<u>3,038</u>	Sales	<u>3,038</u>
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## ADVERTISING

Cash	<u>200</u>	Selling	<u>200</u>
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## ESTIMATING

Pay Roll <sup>6</sup>	<u>5</u>	Selling	<u>5</u>
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## SELLING

Pay Roll <sup>6</sup>	100	Sales	341
Space Cost	25		
Administration	11		
Advertising	200		
Estimating	<u>5</u>		
	<u>341</u>		<u>341</u>

## SALES

Stock	3,038	Cash	3,510
Selling	341		
<i>Loss and Gain</i>	<u>131</u>		
	<u>3,510</u>		<u>3,510</u>

## LOSS AND GAIN

<i>Balance</i>	646	Rent	200
		Interest	315
		Sales	<u>131</u>
	<u>646</u>		<u>646</u>
		Balance	<u>646</u>

<sup>1</sup> These debits to Manufacturing and credits to these accounts are posted from the totals of the charges to individual orders.

<sup>2</sup> This is on the supposition that the real estate is owned by the concern. If not, the only difference is that another entry will debit Rent and credit Cash, and then, since Rent is closed, no item of rent will go to Loss and Gain as an earning.

<sup>3</sup> Stores Costs is here, for brevity, consolidated with Stores.

<sup>4</sup> These adjust the discrepancies between the charges to orders, based on estimates for joint costs, and the actual costs found at the end of the year or other settling day. In two of these cases, Burden Adjustments shows that the charges to orders were a trifle less than the actual burden; in one case it shows excess.

<sup>5</sup> This account suggests the condensed nature of some of the items shown here. Properly this account should be cut up into several, as Stationery, Postage, Telegraphing, etc. Stationery, moreover, should be closed not only into Administration, as here, but also in part into Stores, Superintendence, etc.

<sup>6</sup> It will be noted that both Estimating and Selling are debited by Pay Roll, and yet Estimating is ultimately closed into Selling. A short cut would be to close Estimating into Selling first, and then to debit Selling by Pay Roll. This would not be good accounting, however, for, since the wages of estimating would be combined with the other wages of selling, it would not show anywhere the actual costs of the estimating department.

For the sake of making these entries balance, we may show also the following items of resource accounts, complements of those given above.

CASH			
Sundries	3,510	Sundries	2,693
		<i>Balance</i>	<i>817</i>
	<u>3,510</u>		<u>3,510</u>
Balance	817		

BUILDINGS	
Depreciation	60

MACHINERY	
Depreciation	111

A trial balance taken of *these* items after the books are closed shows the following interesting figures, and no others, for all other accounts are balanced:

Loss and Gain		646
Cash	817	
Machinery		111
Buildings		60
	<u>817</u>	<u>817</u>

The credits to Machinery and Buildings are of course mere depreciation items to be added to the other items standing to those accounts, that is, to reduce the debit balance and show a reduced valuation. If the figures of the trial balance above are taken to represent thousands of dollars, the profits are \$646,000, and the increase of \$817,000 in cash from the year's business is derived chiefly from the profits, but in part from the wearing out of machinery and buildings converted during the process into goods which are later sold for cash. This sum of \$171,000 from depreciation is available for replacement or a replacement fund, but of course it is not available for dividends, for the books show that the profit is but \$646,000.

In spite of the brevity of the final result, as shown in the trial balance above, the details are preserved all along the line and can be reported as fully as any one may desire.

It is obvious that in factory accounting, as well as in other kinds, statistics are important. We have already seen the need for many

such figures in our determination of machine rates. The general subject of statistical accounting has been illustrated in Chapter XI. It is enough to note here that the field for serviceable figures of this sort is very large. For example, from the available statistics on our job order slips, charts can be prepared showing numerous ratios which the manager may find desirable to watch, — such as the ratio of product to the number of men employed, product to power consumed, power consumed to number of men employed, product to material used, power produced to fuel consumed, fuel cost to labor cost.

We may now turn to the question of factory depreciation, a subject which has been left for comprehensive treatment by itself. This question of depreciation in factories is quite as serious as on railroads and is more complicated. A railroad of considerable size suffers depreciation all the time for many kinds of property on different parts of the line under different conditions of wear and influences of climate. It is unlikely that on a railroad the number of engines giving out entirely, so that they are better fit for the scrap heap than for the repair shop, will be much greater in 1908 than in 1907, for on most important roads the number of engines is so great that a fair proportion will need replacement each year: the conditions of service will vary so greatly that not all engines bought at one time will require replacement at one time. So, as we have already seen, Maintenance of Way and Structures and Maintenance of Equipment will serve as a fair measure of depreciation under normal conditions, though it is true that many railroads maintain special depreciation funds. In most lines of manufacturing, however, a similar condition is not true. Of course, much of the wear and tear in factories can be made good by ordinary repairs, such as replacing a worn cogwheel with a new one, a worn belt with a new one, replacing a chimney, or what not; but when it comes to the end of such repairs, to the time when further repairs on the old machines is bad economy, we are likely to find that repairs do not divide maintenance properly between different years. For example, a cotton-mill is likely to equip a picker-room or a weaving-room complete at one time. It is indeed likely to equip many rooms at one time. The consequence is that repairs for a few years may have been \$1000, and then when replacement of looms in the weaving-room becomes

necessary an immediate expense of \$50,000 must be faced. Next year repairs may fall to \$2000, and the year following jump to \$25,000. Under such conditions ordinary maintenance is no criterion for depreciation. Depreciation must be figured theoretically each year, and in manufacturing it must be figured by methods much more elaborate than in ordinary mercantile business. In the case of merchandise a fairly uniform rate pertains to any particular line, but in factories many rates are operative at once. Some buildings of a factory may depreciate at less than 2% per year — for example, a stone warehouse or boiler house, — while others — for example, a wooden foundry — may depreciate at more than three times as much, the rate being influenced by heat, smoke, steam, gas, etc. Buildings housing heavy shafting which revolves at high speed, and containing machinery operating with much jar, depreciate with comparative rapidity. Machines depreciate more rapidly than buildings, and some machines more rapidly than others. Tools, again, depreciate more rapidly than machines. The depreciation of these things, moreover, varies in different degrees with respect to time and kind of use. Buildings will depreciate perceptibly with mere lapse of time; machines, if unused and well cared for, less rapidly; and tools, if unused and well cared for, hardly at all. Depreciation on an idle machine shop, then, is comprised of at least three items, the effect of time on buildings, on plant, and on tools. Depreciation on a running machine shop is comprised of six items at least, the effect of time and of use on buildings, on machines, and on tools. If a shop is run much overtime, a new set of causes comes into play. A machine shop run night and day will suffer depreciation made up of at least eight items, — from time, use, and abuse for the buildings, from time, use, and abuse for the machinery, and from time and use for the tools — tools being practically never used incessantly. It is on these considerations that the amount of depreciation should be determined as an element in the machine rate.

One other feature of factory depreciation is essential for an accountant. The invention of new machinery may render old machinery useless, — so far at least as goods made on the old cannot compete with goods made on the new. Machinery is perhaps as often put out of use by obsolescence as by wear and tear. The prob-



ability of changes differs in different lines of business, however; some lines cannot be changed radically, and others have been mechanically revolutionized every ten or fifteen years, and are likely at any time to be revolutionized again. An accounting policy which pays no attention to probabilities of this sort is clearly not worth much. Usually something should be set aside for the almost inevitable change.

As soon as an attempt is made to provide for writing off valuation of machinery, question arises as to the basis. Shall the amount of depreciation be taken as a fixed annual sum, as an increasing sum, as a decreasing sum, or shall a sinking fund be established? A good argument can be given for each; and in any particular case the most fitting argument should decide. A machine is usually efficient, that is, at a constant production, as long as it is kept in use, — or it would be abandoned; so a constant annual charge may be the best device for depreciation. A machine depreciates but little in the first few years; so an increasing sum is an excellent device. Since the true measure of cost of depreciation is not mere shrinkage of assets, but this shrinkage plus the cost of repairs, and since repairs are usually low in the early life of a machine but high in the late years, the years of low repairs should see heavy arbitrary writing off of values to keep the total true; since, moreover, a machine is in early years competing probably against old machines, and is in later years competing against new machines, it can afford to suffer heavy charges in early years and cannot afford them in late years; since, again, new machines may at any time change the methods of manufacture and render the old machines obsolete, no time is too early to set aside a fund for replacement: so a plan giving heaviest depreciation sums in the early years is an excellent device. Finally, if funds are actually set aside, they may be put at interest; and so the early installments will increase by compound interest and therefore by so much reduce the requirement. It is obvious that, taking all things into consideration, the third of these plans — providing decreasing sums — is most often likely to prove satisfactory. It makes allowance for practically every contingency in the conditions under which it is meant to apply; and to great extent it combines the virtues of some of the other plans. For example, it recognizes the low repairs at the basis of the second plan; and its decreasing rate is due to the ac-

cumulation of depreciation sums of early years — far in excess of the accumulation of a sinking fund.

The methods of determining this arbitrary depreciation are various. It is possible to work out elaborate mathematical formulæ for the purpose; but for practical purposes, since the rate is more or less arbitrary at best, simple arithmetic is adequate. The difference between the cost value of the machine and its scrap value represents the shrinkage to be divided over the years. A very satisfactory method is to divide the shrinkage by the sum of all the numbers representing the years of its life, and depreciate each year a fraction comprising the number of the years to run as a numerator and the sum of year-numbers for a denominator; for example, if the lifetime is five years, add 5 and 4 and 3 and 2 and 1, getting 15, and in the first year write off  $\frac{5}{15}$ , in the second year  $\frac{4}{15}$ , and in the last year  $\frac{1}{15}$ . This method, applied to a machine costing \$200 to last five years with a final scrap value of \$20, would work out as follows:

$$\$200 - \$20 = \$180 \text{ shrinkage}$$

$$\text{Denominator} = 5 + 4 + 3 + 2 + 1 = 15. \quad \$180 \div 15 = 12$$

Year	Depreciation Fraction	Depreciation	Valuation
0			\$200.00
1	$\frac{5}{15}$ (of \$180)	\$60.00	140.00
2	$\frac{4}{15}$	48.00	92.00
3	$\frac{3}{15}$	36.00	56.00
4	$\frac{2}{15}$	24.00	32.00
5	$\frac{1}{15}$	12.00	20.00

This gives a depreciation of one third in the first of the five years, and of only one fifteenth in the last. This is a fair distribution for so short a time. It is very nearly a steady depreciation of 35% on the last valuation.<sup>1</sup>

<sup>1</sup> A good many writers on this subject recommend the determination of a percentage which applied each year to the last valuation shall reduce it as desired. A formula for this is given in Appendix F, page 332. Its application for the situation given in the text gives a figure for depreciation of 36.905%. This shows values of the machine in succeeding years as follows: \$200.00, \$126.19, \$79.62, \$50.24, \$31.70, \$20.00. That method is applicable, however, only when a scrap value is expected to remain; for no percentage but 100 will ever completely wipe out the last valuation. The method described in the text is applicable in all cases, for it is based not on a percentage of reduced valuation, but on the original cost.

A common objection to a sinking fund is that usually a business can earn more by using a fund than it can get in interest if investment is made outside. When the fund is left in the business, however, one essential caution must be observed, — not to lock up the fund in machinery, for to lock up in machinery of an old type a fund for the purchase of new machinery is to pervert it entirely from its function. Such funds must always be utilized in something which can be converted into cash at once.

The entry upon the books for any of the methods described is simply a debit to depreciation and a credit to machinery account for the annual sum written off, with the addition of sinking fund entries if such a fund is established. Then depreciation account at the end of the year is closed into Profit and Loss. This reduces the figure of net profits. Since this depreciation is nominal, that is, registers not the loss of tangible things owned by the company but merely a recognition that certain of the tangible things in the form of machinery have shrunk in value, the entry really means that the amount of such depreciation, instead of being distributed as dividend, is retained in the form of other assets not machinery, perhaps cash, into which by use the machinery has been in part converted; or, to express it in another way, the corporation appears, before depreciation is considered, to have assets more valuable than they really are, and the books show that certain other assets which might physically be distributed as dividend are retained in the business as an offset for the shrinkage of machinery.

Still a fifth method of figuring depreciation is possible, but it is hardly wise in practice. By it the machinery is revalued each year, and the shrinkage is charged against revenue. It requires practically as much figuring as the other methods, for any one valuing old machinery will inevitably use an arbitrary depreciation rate. It lays the account open, moreover, to constant fluctuations because of changing market conditions, whereas for manufacturing purposes fluctuations are of no moment and a constant or at least a progressive rate is the only matter of consequence after the machinery has once been installed.

Manufacturing accounts are given in published reports of corporations under many dissimilar plans, and it is impossible to interpret them except with some recognition of the fact that a name may

stand for many different things in different reports. Always, however, if the reports are worth anything, they can be interpreted by general bookkeeping principles. For instance, a trial balance or a balance sheet may present the following items: Stores, with a debit balance; Wages, with a debit balance; Sales, with a credit balance: then an inventory may be given for Stores and for Sales. This clearly cannot be worked out on the same principle as the scheme described in this chapter, for in this case we have Stores with both a debit balance and an inventory, whereas under the scheme given above the debit balance was the inventory. The only explanation possible here is that the Stores debit balance indicates stores bought. Wages account here cannot be similar to that described above, with a credit to the employees as wages were earned and a debit as they were paid, else there could not be a debit balance; and so a debit balance here must mean the total of all wages paid. Obviously, too, if Sales has an inventory, the credit balance is not pure profit, but indicates the total amount of sales; and to determine profit we must work out an income sheet somewhat as follows:

	Stores debit		Sales credit
	<u>Inventory of stores</u> :		<u>Inventory</u>
(difference)	Cost of material	(sum)	Product
	Wages debit		<u>Cost of product</u>
	<u>Expense, etc.</u>	(difference)	<u>Gross Profit</u>
(sum)	Cost of product		

The combinations that may arise are innumerable, but if the accounts are good for anything the application to them of general principles should make them intelligible.

An excellent form of income sheet is given in Chapter VII, page 76, from the reports of the United States Steel Corporation. The more detailed form, shown on page 78 for a trading concern, is equally applicable to manufacturing accounts.

## CHAPTER TWENTY

### SOME GENERAL PRINCIPLES ILLUSTRATED IN MUNICIPAL ACCOUNTING

WE have so far been considering accounts chiefly with reference to profit and loss. Some accounting has really a very different purpose, may indeed have little or no profit or loss connected with it. Such chiefly is the accounting of municipalities and other political bodies. Though the accounting of administrative organizations like a city government is usually pretty bad, excuse can be found in the fact that the system in use is likely to be traditional. In the old days of administrative government in this country, the financial operations of the municipality were few. The city needed to recognize practically nothing more than the responsibility of the town treasurer. So long as the books showed that he had accounted for every cent received, the town was satisfied. As the municipal activity grew, paving, sewerage, etc., were gradually added on a small scale. The question then arose whether this or that administration of town affairs was the more economical. Each administration told itself that it must show a low cost. It therefore, when possible, neglected to allow for depreciation or for any but imperative maintenance, and showed expenditure at its lowest basis. When, on the other hand, conditions reached a point at which renewals became necessary, the administration in charge pointed to them as really charges upon the past, or treated them as capital investments, thus shifting the odium of increased cost. Most cities make no distinction between the cost of a new ferry-boat and the cost of painting an old one, or between the cost of a new boiler and the wages of a man to run it. The result of all this is that in most cities no correct figures of actual cost have ever been published. The community perhaps remembers reported cost in the years when good luck favored the administration, so that maintenance and renewal were low; and all higher costs have been discounted by vague excuses. A low figure has become a standard which no administration can successfully reject unless it can effectively point to extraordinary cost for renewal or for capital account.

It takes a bold administration in the face of all this to come out with accounts that represent faithfully what expense the government has incurred. Practically no such administration has appeared in any city. It would be hardly fair to say that the failure is due always to lack of courage: it may be quite as often due to indifference or to ignorance of the real situation. When, a few years ago, people began to agitate the question of public as compared with private gas works, water works, telephone service, etc., they came to see that statistics are essential; and then they came to see that the figures of municipal cost accounts are nearly worthless.

What effect has the common practice upon the value of municipal statistics? Let us take a few examples. We may desire to learn what is the cost of conducting the public library and to compare it with some figures for other cities. Perhaps the city owns its own lighting plant and charges nothing to the library for lights. Perhaps the city owns its own water supply and furnishes to the library water to run a motor for its book elevators. Perhaps on duty at the library are policemen, who serve as watchmen night and day, and their wages are paid not from library funds, but from police funds. If the library in the other city with which we are to compare this one has to pay high lighting charges, water charges, and watchmen's wages, a comparison of costs between the two is to great extent worthless. It would be impossible usually to learn whether in the other city these costs are met from library funds or from funds of other departments. Obviously, the trouble does not stop here. Suppose we wish to compare lighting costs for this city with lighting costs in another where the library charges are paid independently. Our comparison is thrown out of balance. The difference will be slight for one building, but if the same careless accounting prevails throughout the city departments, in the City Hall, fire stations, police stations, etc., the difference may be more than the whole difference in cost between private management and public management. Similarly, the comparative cost of water and of police service in the two cities is by so much thrown out.

The chances of misrepresentation in city affairs are far more numerous and important than at first sight appear. If the water department is careless, it may not charge the fire department for the great consumption of water at fires, and both water cost and fire-

protection cost are misrepresented as compared with cities where water must be paid for. If the water department borrows fuel, and does not repay it, from the public buildings department, and perhaps then lends fuel to the street-cleaning department for tugboats hauling scows to deep water, all three departments are misrepresented and a comparison is by so much misleading.

Usually, too, city statistics of cost include so many peculiarities of accounting that an outsider can do but little with them, and the heads of the departments themselves cannot always tell exactly what the figures mean. Indeed, the greatest security of the host of grafters whose doings have been disclosed so widely in the last few years is in the fact that in practically no city, county, or State, or even in the national government, has an adequate basis been established for determining what should be the cost for the services secured.

Work which in some cities is done by one department is in others required of another department. A comparison of department costs is useless unless details of this sort can be learned. For example, one city will charge to the paving department what another charges to the sewer department, and yet one of these serves public convenience and the other public health; so a comparison of the two cities in their ratio of expenditure for public health is by this difference misleading.

Municipal accounts are further confused by the fact that there are likely to be three different points of view from which the statistics are reported. Since the heads of departments usually are immediately responsible for the distribution of funds, their point of view is that of the practical man whose interest is chiefly in the details of his own work; and their reports are on that technical administrative basis. The accounts of these heads of departments, however, are likely to be recast by the auditor, through whose hands they must pass. He must see to it that the expenditures are out of particular funds or appropriations at his disposal. His classification of expenditures, then, is likely to be based not at all upon their particular purpose, but upon the peculiarities of the legislative acts authorizing them; so his point of view is technically legal. Finally, some cities have organized accounting departments, whose purpose is principally economic. Such a department will recast the accounts on the basis of

the social service accomplished by the expenditure. It may happen in many cases, therefore, that three sets of accounts for the same expenditure are placed before the public, — one based on mere administrative or engineering convenience, one on mere legal chance, and one on economic principles. Unless one knows under which classification the accounts at hand happen to fall, one is likely to find difficult any intelligent judgment in a comparison of one city with another or in an attempt to learn actual cost for any particular service.

An effort has been making for a number of years to secure uniform accounting in the different cities of the country, so that comparisons shall be possible for economists, sociologists, and students of administrative matters. The State of Ohio has passed a law requiring all municipal accounts to be made on a certain form, but this has been done so recently that the full benefit of the results has not yet been attained. Several cities in Massachusetts have been for a number of years attempting this sort of thing. Several large cities in different parts of the country have joined in this movement. The most that can be said is that the tendency is strongly in that direction, and that through the efforts of the National Municipal League, which has taken the initiative in this matter, it is probable that in a few years it will be possible to compare in many details many cities of about the same class. At present, though a number of cities have adopted in the main a plan outlined by the League, they have not yet quite agreed upon a uniform schedule, and since each in its own way is attempting to do the thing ideally, just enough diversity remains to throw considerably out of accuracy the judgments that one might form by comparing reported figures.

The scheme as outlined by the National Municipal League divides the total expenditures of a city into four groups: first, ordinary expenditures; second, extraordinary expenditures; third, trust funds; fourth, bookkeeping items. Receipts are divided on the same plan. The ordinary items would consist mainly of taxes and the expenditures met from them or for their collection and administration. The extraordinary items are money borrowed or raised in other capital ways and the expenditures made from such receipts. Trust funds are, of course, in a class by themselves, and the expenditures must bear an exact relation to receipts; obviously for purposes of good



accounting the distinction between trust funds and ordinary and extraordinary receipts is rather legal than economic. The book-keeping items are sums which do not affect the ultimate resources or liabilities or expenses of the city, and may be illustrated by taxes collected for the State and ultimately turned over to it, or sums borrowed temporarily while awaiting the payment of taxes. Roughly speaking, at least theoretically, extraordinary expenditures are for capital account, as for bridges, sewers, etc., and by so much may be taken to represent investments; but oftentimes what appears to be capital expenditure is not so in reality.

These four groups are next subdivided, in the scheme of the National Municipal League, on an economic or social basis. This schedule is worth reproduction here, for though exceptions may be taken to it here and there, it is in the main an excellent illustration of classification of expenditure on sound principles.

#### I. General government

1. Mayor's office
  - (a) Salary
  - (b) Incidentals
2. Legislative department
  - (a) City Council
  - (b) City Clerk
3. Law department
4. Finance department
5. Bureau of elections
6. Printing
7. Buildings not in other departments
8. Registration
9. Miscellaneous

#### II. Protection of life, health, and property

1. Police department
2. Fire department
3. Courts
4. Jails, prisons, and reformatories
5. Health department
6. Cemeteries
7. Inspection of buildings
8. Militia and armories
9. Miscellaneous

## III. Public charity

1. Hospitals
2. Care of insane
3. Homes for the aged and for defectives
4. Almshouses and workhouses
5. Lodging houses
6. Outdoor relief
7. Miscellaneous

## IV. Public works

1. Administrative expenses
2. Opening and grading streets
3. Street paving
4. Sidewalks
5. Street cleaning
6. Street sprinkling
7. Street lighting
8. Garbage removal
9. Snow removal
10. Sewers and sewage disposal
11. Bridges
12. Miscellaneous

## V. Public industries

1. Water works
2. Gas works
3. Electric light plants
4. City real estate
5. Markets
6. Docks and wharves
7. Transit subways
8. Subways for pipes and wires
9. Miscellaneous

## VI. Education, recreation, and art

1. Schools
2. Libraries
3. Museums and art galleries
4. Recreation
  - (a) Parks
  - (b) Playgrounds
  - (c) Gymnasias
5. Baths
6. Celebrations
7. Miscellaneous

It is easy to criticise any scheme of this sort. For example, though the costs of the health department and of cemeteries are in group II, the costs of garbage removal and of sewage disposal are in group IV, and the cost of baths is in group VI; yet the primary purpose of all these expenditures is public health. If, on the other hand, these were all in the same group, certain other classifications would be thrown out. The general criticism of the schedule is, perhaps, that it is governed rather by administrative or economic considerations than by sociological — as instanced by the cases above. The main thing to be desired, however, is sufficient clearness and uniformity: if these are provided, as they pretty satisfactorily are by this schedule, the accounts can be interpreted intelligently from any point of view.

Few cities have tried to construct a balance sheet; but to do so seems altogether worth while. Cambridge, Massachusetts, did so a few years ago with interesting results. The available assets are divided into numerous groups, such as current, contingent, trust, and sinking fund. The fixed assets are distinct. The liabilities are divided into current, contingent, trust, and bonded-debt groups. A comparison of available assets with total liabilities shows the excess of liabilities, — practically net debt. Then to the available assets are added the fixed assets (unavailable city property reported by departments), and this total is compared with total liabilities, showing a surplus. In other words, this surplus represents what the city still has to show for taxes collected in past years. Included in the contingent assets are delinquent taxes, and included in the contingent liabilities are contractors' payments retained, disputed sums, etc. This Cambridge form appears as follows:

Assets		Liabilities	
	[All figures are thousands of dollars.]		
Current	519.8	Current	94.5
Contingent	276.5	Contingent	241.4
Trust	85.8	Trust	85.8
Sinking Funds	<u>2,371.8</u>	Bonded Debt	<u>8,840.5</u>
Total available	3,253.9	Total	9,262.2
Total fixed	<u>11,151.8</u>	Surplus	<u>5,143.5</u>
	<u>14,405.7</u>		<u>14,405.7</u>

A bookkeeping peculiarity of administrative accounts is that money is expended by departments having no income. Such ex-

penditure is usually by order on the treasury, to apply on particular appropriations. Care must be taken that the authority to spend is not exceeded. Sometimes unexpended balances from previous years may be spent in addition to the current appropriation, and sometimes they must be covered into the treasury. Sometimes miscellaneous income may be added to the appropriation. A convenient form for watching the relation between expenditure and appropriation may be illustrated, for four items only, as follows:

	Balance from pre- vious year	Income credited to appropria- tion	Original appropria- tion	Total Credit	Actual Expendi- ture	Surplus	Deficit
Salaries							
Supplies							
New Buildings							
Repairs							

Since in administrative affairs no profit or loss is to be distributed to proprietors or to stockholders, the accounts do not need to be closed at the end of a year. For example, the books may show open accounts for taxes assessed many years back. New accounts should be opened each year for each class of taxes for the year, and these should be kept open, to show a debit of assessments and a credit of payments, as long as any remain unpaid (unless collection be abandoned).

The common practice in administrative accounting has been single entry; but the tendency nowadays is toward double entry. Many of the departments of the national government have recently been put on a double-entry basis.

A feature of accounting almost universal in administrative affairs, but common also in other connections, is sinking funds. These differ from ordinary reserve funds because when once started they go on increasing of their own momentum, and because they are usually maintained for the specific purpose of paying funded debt. The sinking fund is an old device and is thought to have about it a certain mystical sacredness. The operation of a sinking fund in its simplest form is as follows: a certain sum is set by as a sort of nest egg; with this sum as many as possible of the bonds to be redeemed are purchased; then the government or corporation collects interest

from itself on these bonds as interest becomes due, and adds that to the fund. That is, it invests money in buying bonds, upon which in turn interest is collected and invested in more bonds, and so on interminably. The government itself pays interest to itself, and this interest continually accumulates more. It is nothing but compound interest, and there is really nothing magical about it. Of course, no one can get rich by paying interest to himself, and no government is saving anything by this process. If nothing were set aside at the start, an investment of capital earning interest and spent in buying up the government's own debt, nothing would be saved. As a matter of fact, however, a sinking fund is not usually quite so simple as described, for usually an annual appropriation is added from taxes, so that the figures may be like this:

Years	Total Bonds at Beginning of Year	Annual Investment	Total invested at Beginning of Year	Interest earned
1		\$1,000	\$1,000	\$50
2	\$1,050	1,000	2,050	102.50
3	2,152.50	1,000	3,152.50	157.62
4	3,310.12	1,000	4,310.12	215.50
5	4,525.62	1,000	5,525.62	

This, of course, gives a rather rapid increase in the fund, not merely by means of the principal, but also by means of the interest. It is now to be noted that, if we assume to be unchanged the city's resources and its willingness to pay debt, the conditions would have been exactly the same without the sinking fund. Let us assume, then, that the city will spend \$1000 a year in paying off its debt, and that instead of establishing a sinking fund it simply buys bonds and cancels them. If \$1000 has been spent in this way in the first year and the bonds cancelled, in the next year the city's expenses will be reduced to the extent of the saved interest; and if this saving is now invested in the bonds, as it may be since the city has escaped so much interest, we shall find in that year that \$1050 may be spent for the debt. Each year's cancellation of bonds, of course, means a saving of interest not only for that year but for all subsequent years. This plan followed year after year will show the following results (distinguishing the saving on each year's cancellation of bonds):

Invested from Income	Saving
1st year \$1,000	\$50
2d " 1,050	50 + 52.50 = 102.50
3d " 1,102.50	50 + 52.50 + 55.12 = 157.62
4th " 1,157.62	50 + 52.50 + 55.12 + 57.88 = 215.50
5th " <u>1,215.50</u>	
Total 5,525.62	

This compared with the other table shows that at the end of the period exactly the same result has been produced with no greater sacrifice. In other words, the sinking fund is of absolutely no intrinsic value. It does not earn anything for the city, and the city can pay no more with the sinking fund than without it. Why, then, is the hue and cry raised by any attempt to tamper with the fund? The fact is that in the eye of the public a sinking fund has a sort of sanctity, and the legislator or administrative officer who would not scruple to tamper with other arrangements will hesitate long before misusing such a fund. The public complains at seeing taxes levied to pay off debt, but somehow thinks a sinking fund a sort of goose that lays golden eggs. This is just the virtue of the sinking fund. It enables a government or a corporation to pay debt without opposition, and the power of the fund lies wholly in the prejudice in its favor.

Indeed, sometimes paying debt by a sinking fund costs more than paying it by any other process, for, unfortunately, sinking fund commissioners are sometimes required by law to buy the particular debt which the fund is intended to wipe out, and when that debt is at a high premium, owing to market conditions, actual loss may be suffered. Usually however, even under those conditions, the public still clings to the notion of the golden eggs.

The accounting of sinking funds is likely to be a little puzzling. So far as the funds have been taken out of earnings, they constitute a liability of the business or administrative body; and, therefore, a fund must appear on the credit side of the balance sheet. The property in the fund itself, on the other hand, is always a resource. If such a fund has arisen simply from the conversion of one kind of property into another, however, it will appear on the assets side only. Often a sinking fund is intrusted to specific persons called sinking fund commissioners, and they, as trustees, are considered as debtors to the corporation, that is, are held responsible. Under such condi-

tions, the books of the corporation proper need not give details for the management of the fund. The commissioners are of course obliged to record details, keeping record of all increases of the fund, and all expenditures on its account, and all investments. Then, at suitable intervals, the books of the main corporation are made to agree with the books of the commissioners, through a report sent by the commissioners to the body which they serve.

## CHAPTER TWENTY-ONE

### SOME MISCELLANEOUS APPLICATIONS OF GENERAL PRINCIPLES

#### *I. The Treatment of Commercial Discounts*

THE common method of treating discount allowed for early payment of bills is to debit an account called Merchandise Discount and credit the customer. Conversely, for all discounts taken on purchases it is common to credit Merchandise Discount and debit the firm from which the purchase was made. In the end, Merchandise Discount is commonly closed out into Merchandise. The result of this method is to show the actual occurrence so far as things appear on the surface, — that is, to charge merchandise account for the actual net payment for merchandise bought and credit that account for the net amount received on merchandise sold. This appears to be a desirable thing. As we saw in discussing the main principles of the balance sheet, however, it is likely to happen that the worse the credit of the concern buying goods, the higher will appear the value of its merchandise on the books. If, that is to say, a concern has such poor credit that it can pay its bills only at the last moment, it is paying the maximum price and its merchandise account is debited for that price. A concern with good credit and good management, on the other hand, will always take the highest discount offered and will have a correspondingly low valuation for merchandise. The same goods, bought from the same dealer, on the same offered terms, will have a higher book value for a poor concern than for a good one. This exposes at once the objection to allowing Merchandise to be affected in any way by discounts. If the terms offered on a bill of goods are 6% in ten days, 5% in thirty days, and net sixty days, it is obvious that a man who pays his bill in ten days is paying much more nearly the real cost of the merchandise than the man who pays his bill at the end of the sixty days. The cost of manufacturing and distributing the goods sold to the sixty-day man is no greater than that of the goods sold to the ten-day man.



In other words, the difference of 6% has nothing to do with the cost of manufacturing or distributing the goods. It has nothing whatever to do with the merchandise. It is simply a payment for delay and risk. It is not based on the usual interest rate, to be sure; but the charge is still of the nature of interest. In all other particulars except this matter of delay in payment, the bills are the same. It is obvious, therefore, that the 6% should not, except temporarily, enter into the merchandise account. What is the proper debit to Merchandise for goods bought? If dealers can sell the goods at 6% less than the billed price, the billed price less 6% is the natural price of the goods. If, indeed, they will give 7% for spot cash, the billed price less 7% is the only proper charge to Merchandise.

This may seem too great a refinement of the principle of distinctions; but it is a matter of far greater importance than most business men realize. It is easy enough for a man to say, "If the discounts that I take amount to as much as the discounts that I give, I am losing nothing by this method of conducting my business." The obvious answer is that there is no necessary relation between the discounts that he takes and the discounts that he gives. It is not necessary, in order to receive the largest price on goods sold, that he shall pay the largest price on goods bought. If a man whose credit is good can borrow money at 6% per year, it is the height of foolishness to borrow money at 6% for 50 days, — as he is doing when he is offered 6% discount in ten days but pays net in sixty days. The discount lost can under no circumstances be looked upon as anything else than a sort of interest payment, — though at a much higher rate than normal. Taking or giving a discount is not earning anything or losing anything: it is simply paying or realizing the normal price.

Accounting should show what are the costs of conducting various parts of the business and what results would be attained by any possible economies. What a man really needs to know, then, is not what discounts he has taken, but what discounts he has lost. A charge should be made not for discounts which his customers take, but for discounts which he himself fails to take. A business man who, at the end of the year, is presented with a ledger account showing that he has lost in discounts \$500, is not going to offset that loss by discounts forfeited by his customers even to the amount of \$700. He is going to see at a glance that the discounts lost by his customers are clear

gain to him, and would have been received just the same whether he had lost discounts on his own purchases or not. He is going to realize that the \$500 lost has brought no compensating gain except the saving of interest that he would perhaps have had to pay if he had borrowed money at the normal rate to enable him to discount his bills; but borrowing at 6% to save 42% is worth while.

The proper treatment of these discounts, then, would shift the point of view from that commonly maintained. Since no one is absolutely sure, at the time a bill is sent out or received, whether the discount will be taken or not, the goods must be entered at the full price. In any case, whether the discount be taken or not, the amount should be ultimately reduced by the discount, for the billing price includes an item not properly called merchandise, as has been shown. The only question is concerning the account ultimately responsible or creditable. If the buyer takes the discount, the amount goes to his account on the seller's books and to the seller's account on the buyer's books; if he does not take it, the discount may be entered to Neglected Discounts on the buyer's books and to Collected Discounts on the seller's books. In case of an alternative discount, such as 6% in ten days or 5% in thirty days, if the 5% is taken 1% is forfeited. This 1% should be debited by the paying firm to Neglected Discounts, the 5% should be debited to the selling firm's account, and 6% should be credited to Merchandise. Conversely, the selling firm should credit Collected Discounts 1%, credit the customer 5%, and debit Merchandise 6%. This, it will be seen, will leave Merchandise credited for the proper amount, will straighten buyer's and seller's accounts, and will register exactly the loss or gain from neglect of discounts. All this can be done with very little labor. An illustration of one method will be found in Appendix A, I, page 291.

## *II. The Significance of Proprietorship Profits*

One of the most difficult things for accounting to determine is the real, or true net, profit of a proprietorship, especially a single proprietorship. When partnership agreements specify partners' salaries and the rate of interest to be allowed on proprietors' investment, the difficulty is theoretically no greater than in corporations, but practically all proprietorship involves so much commingling of various

elements that differentiation is largely guesswork. For instance, if books are kept so as to represent ordinary conditions, the profit shown at the end of the year comprises three things — proprietor's interest, proprietor's salary, proprietor's return for risk. The matter is not simplified by crediting the proprietor, in advance of closing the books, for interest and for wages; for the question at once arises, Was the allowed interest rate in accordance with the risks of the business as shown by the results, and did the proprietor earn more or less than was credited to him? Figuring interest and wages of management at an arbitrary rate does not help the determination of actual profit.

Every man can get interest on investments (if he is willing to accept a sufficiently low rate), he can get something by working for another (if he will accept what he can convince others that he will be worth to them), and he can get compensation for risks taken (if he is willing and able to take a sufficient number of risks to get a fair average). So interest and salary and return for risk are not peculiar to proprietorship. A man wishes to know, then, how much he gets out of his proprietorship that he probably would not get otherwise. What he gets — as, for instance, a sense of independence — may not be calculable in dollars; but it is at least interesting to know how much in dollars it costs. The possibilities for a proprietor that a salaried man lacks, of course, are the opportunity to make what he is worth — and not merely what somebody else thinks he is worth, — and to take for himself the chances that are continually occurring; but the possibilities are also, of course, to earn less than he might be worth to some one else, and to lose by the ever-recurring turns of chance. How shall he measure the difference in income between a proprietorship (using the word in the sense of a managing ownership) and dependence or retirement?

The approach to a solution — and an absolute solution is impossible, for no one can tell exactly what might have been — is to divide the total profit as closely as possible into its three parts — interest, salary, return for risk. It happens that in the ordinary usage of the word "interest" the element of risk is included; for different rates of interest are paid on loans largely because of the differing elements of risk. For our purposes here, therefore, we must distinguish between pure interest and common interest — not in criticism of the

ordinary use of the word but merely to get out of its meaning an element that we wish to provide for elsewhere. The pure interest rate, with practically all risk eliminated, is found in the business world as the rate on national government loans, for here there is no risk. This rate is a matter of common report (though variations from it in the case of bond issues specially in demand as security for bank-note circulation, etc., must not be confused with it), and it can therefore furnish us a starting-point. We know that the proprietor's capital could earn this rate, without risk, if it had not been invested in the business. Then this rate applied to the proprietor's average investment for the year is a cost of doing business, and no profit is net until this has been subtracted from income. If this is to be entered on the books, as may be desirable, it should have an account by itself, for since it is pure interest it is unlike what is represented in other interest accounts.

We have remaining, then, proprietor's salary and return for risk, — the latter of which we may call the fortuitous element. Neither can be quite determined independently of the other, and so they must be taken in a sort of seesaw relation. Our problem would be simple subtraction if we could determine either of these independent of the other. Yet we can find a few suggestions for each independently. An indication of manager's salary may be found in what he has received, in what he has been offered, in what other men apparently in the same class are getting; yet none of these is necessarily a sound criterion, for a man's value changes both with his opportunities and independently of them, and men apparently of the same class are often thoroughly unlike. Similarly, an indication of return for risk lies in the interest rate for loans under apparently like conditions; though conditions apparently alike are often diverse. The point is that if a man is in business for himself, he should know that he is losing money unless he can earn the pure interest rate, plus as much salary as he would probably get outside, plus compensation for the risks taken. If a series of years shows a failure to accomplish this when no external cause can be found in bad conditions (like bad markets), the presumption is that he as a manager is not worth the salary he has set for himself. He should reduce his salary credit on the books. If, again, conditions have been steady and the sum of his salary and return for risk is in a series of years rising, he may

properly credit himself for the increase. Loss caused by a known error in management should be taken out of the salary share and not attributed to chance. If conditions have been steady, and, though he can find no error in management, the sum of these two elements is in one year smaller than usual, the shrinkage may be properly taken from the risk element, as one of the turns of chance. If, on the other hand, conditions have been unusually favorable to profits, the return for risk, as a fund accumulated in good years for store against the lean years, should be high; and if profits are not actually high, the credit for salary should be reduced.

Very commonly all this attempt at dividing an indivisible sum would not be worth while. It would never be thought worth while by the man who cares only for the amount of his gross profits irrespective of their source. The result of it all, under favorable opportunities for division, is to show a proprietor the maximum that he can have made by being in business for himself. Some men are naturally lucky, — and luck sometimes falls to retired investors, to employees, and to speculators, as well as to managing proprietors. Though the average return to investment is about the government rate (taking into account losses of capital as well as of interest), many men are lucky enough to get more, — often, however, what is called luck is but good management. Some employees are able to impress their worth upon employers far more than others of more worth. Some speculators are able by pure chance to get more than adequate return for the risks that they take. A proprietor, then, must get out of his business at least enough to make his chances as good as they would be if he were to give up his business. Of what has been called the fortuitous element he must get in good years enough to offset the danger of failure to get in bad years the minimum of government interest and manager's salary. Even a high fortuitous element of profit does not necessarily measure his gain above the average by being in business for himself. In ordinary years some fortuitous element must be earned, or the risks will not be paid for. Any excess of this above the normal means only that his gain by being in business for himself is no more than that excess. How much more or less than the average his gain might have been if he had not been in business no one can tell. The question with him is whether this known maximum is enough to make his business career worth

while, — and, as has been already suggested, many elements besides dollars and cents may enter into the equation.

### *III. A Basis for Consolidations*

In Chapter IX a study was made of the comparative earnings and solvency of two corporations and a proprietorship. In any plan for combination, an analysis of the affairs of each concern should be made on the principles applied in that chapter. Of course actual access to the books may be fairly demanded after the negotiations have passed the preliminary stages, and then, if the accounting of any concern seems defective, new income sheets and balance sheets may be constructed and used as a basis for the plan.

It is common to read that balance sheets are of little use in judging the value of a going concern, for earning capacity is what really counts and that is shown only by the income sheet. To great extent this is true, but in a merger a disregard of balance sheets could easily lead to absurdity. Though earning capacity is dependent quite as much on intangible things, like personality and good will, as upon physical property, these intangible things can produce no results in business without the physical property to work upon. In a merger, therefore, consideration may well be given not only to the intangible things which show their results on the income sheet, but also to the media through which these intangible things may work, as shown on the balance sheet. To express the thing more concretely, the combination desires to secure not only the good reputation, the good trade, and the good management, of the separate concerns, but also goods (or machinery), and facilities, and equipment. Even though one of the combining concerns has not made the best use of its physical property, and so has earned little with it, the improved management of the combination should be able to do as much with that property, dollar for dollar, as with any other. If the improved management cannot do so, the property is clearly overvalued, and the revised balance sheet should reduce the valuation. In the merger, therefore, the actual worth of the net assets of all members of the combination should be given equal weight, and a portion of the capital stock should be distributed on that basis alone. When the amount of stock to be distributed on that basis has been determined, the rest may be apportioned on the basis of the excess of earning

capacity over the normal income for that amount of assets, — or the annual value of what is commonly called the good will.<sup>1</sup>

Doubtless no two persons would offer quite the same plan for any consolidation; for no two would put quite the same valuation on assets or estimate future earnings in quite the same way. An accepted scheme is the result of compromise. Usually the weakest member of the combination makes the most sacrifices; but sometimes, because its weakness makes it an element of danger, it must be offered heavy inducements to accept the plan.

The plan outlined above may be worked out on the following suppositions:

	Net Average Assets, 1907	Earnings 1907	Percentage Earnings	Excess over 6%	Annual Good Will
A Co.	\$100,000	\$6,000	6	0	
B Co.	50,000	6,000	12	6	3,000
C. D.	25,000	6,000	24	18	4,500
	<u>\$175,000</u>	<u>\$18,000</u>			<u>\$7,500</u>

In this case, since the total earnings are \$18,000, the capitalization of the combination at 6% would be \$300,000. Of this, \$175,000 would be distributed on the basis of assets; and \$125,000 would be apportioned on the basis of good will, and  $\frac{3}{8}$  of it would go to B Co. and  $\frac{4}{8}$  to C. D. The ultimate facts, then, would be as follows:

	Stock for Assets	Stock for Good Will	Total Stock
A Co.	\$100,000		\$100,000
B Co.	50,000	\$50,000	100,000
C. D.	25,000	75,000	100,000
	<u>\$175,000</u>	<u>\$125,000</u>	<u>\$300,000</u>

This distribution, if the earnings are the same as before, and the same as expected, will give each the same income as before, \$6000.

It is now interesting to note that a distribution of capital stock on the basis of earning capacity only would have produced the same

<sup>1</sup> The significance of the expression "good will" is more comprehensively shown in Appendix B, I, p. 307. The annual value here is simply what is produced by the business above the normal rate of interest on the capital invested. It should be noted, of course, that for determining earning capacity the assets to be compared with the earnings are not necessarily the assets at the end of the year, but the *average net* assets for the whole year, — really the average net capital.

result, *i. e.*,  $\frac{6}{18}$  of \$300,000 to each. Under the other plan, the extra sum which was given to one concern because of its assets was exactly counterbalanced by the extra sum given to another concern because of its extra earning capacity. The smallness of the assets, when the earnings are fixed, is a measure of the excess of earning capacity. So the two methods — one allowing for assets, and the other disregarding them — produce the same results in this sort of case.

The moment we introduce the new element of expected increase in profits from the combination, however, the two methods diverge in results. On what basis shall the expected increase of profits be distributed? The answer must depend largely on the expected source of those profits. If the increase is to come chiefly from an increase of assets, assets should be the chief basis. If it is to come chiefly from the application of the reputation and the executive organization and the personnel of the better concerns to the assets of the poorer, earning capacity chiefly should govern; but the measure of earning capacity for this purpose is really the good will, *i. e.*, the capacity to earn greater than ordinary profits. Let us try these cases and compare results with the distribution on the basis of earning capacity only.

Suppose the expectation is that earnings will increase one third, or to \$24,000. This, at 6%, would justify a capitalization of \$400,000 (leaving out, for the sake of simplicity, any margin for safety). On a basis of simple earning capacity, this would give to each concern capital stock to the amount of \$133,333.33; for as their previous earnings were each \$6000 out of \$18,000, each would be entitled to one third the issue of \$400,000. When we make separation between the claims on account of assets and on account of good will, however, we find far other figures. If we assume the increase to be due to the good management of the better concerns extending over the poorer, we distribute the stock, above the requirement to cover assets, on the basis of the measure of that good management, namely, the excess profit or good will of those concerns. This works out as follows:



	Stock for Assets	Annual Good Will, as before	Share of \$225,000 Stock	Stock for Good Will	Total Stock
A Co.	\$100,000				\$100,000
B Co.	50,000	\$3,000	$\frac{2}{3}$	\$90,000	140,000
C. D.	25,000	4,500	$\frac{2}{3}$	135,000	160,000
	<u>\$175,000</u>	<u>\$7,500</u>		<u>\$225,000</u>	<u>\$400,000</u>

If we assume the gain from combination to arise from the increase in assets, the share for good will remains as in the first case, and the rest is distributed in the proportion of the assets of each, — *i. e.*, \$125,000 for good will and \$275,000 for assets, as follows:

	Assets	Annual Good Will	Stock for Good Will	Share of Stock for Assets	Stock for Assets	Total Stock
A Co.	\$100,000			$\frac{1}{3}$	\$157,144	\$157,144
B Co.	50,000	\$3,000	\$50,000	$\frac{2}{3}$	78,571	128,571
C. D.	25,000	4,500	75,000	$\frac{2}{3}$	39,285	114,285
	<u>\$175,000</u>	<u>\$7,500</u>	<u>\$125,000</u>		<u>\$275,000</u>	<u>\$400,000</u>

The last two cases, as compared with distribution on the basis of earning capacity alone, show that only by a separation between assets and good will is it possible to approximate a fair basis for apportionment, — or at any rate one that shall be satisfying. Any degree of variation may be made, and all on a scientific principle; for agreement may be made in advance as to how much of the stock issued for expected increase in earnings shall be distributed on the basis of assets and how much on the basis of good will. It may indeed happen that under such an arrangement a concern with heavy assets but low earnings may be forced to sacrifice on its share of stock distributed for assets in order to compensate the others for its low earning capacity, — or, more exactly, for the opportunity to share in their high earning capacity; but such allowances introduce no complications.

It is now interesting to see how the three distributions of stock as applied above affect the income of these three concerns, assuming the expected earnings to be realized by the combination.

	On Basis of Earning Capacity		Combined Basis chiefly Good Will		Combined Basis chiefly Assets	
	Income	Increase	Income	Increase	Income	Increase
A Co.	\$8,000	\$2,000	\$6,000		\$9,429	\$3,429
B Co.	8,000	2,000	8,400	2,400	7,714	1,714
C. D.	8,000	2,000	9,600	3,600	6,857	857

In all cases except one, some benefit is derived from entering the combination; in that exception, benefit might consist in security for an income precarious outside the combination.

## CHAPTER TWENTY-TWO

### AUDITING

AUDITING is undertaken usually for one or more of three purposes, — to determine the legality of transactions, to detect errors in the records, to determine the correctness of the conclusions drawn from the books. In affairs of government, the functions of auditors are often separated, one man passing upon the legality of acts and another upon the accuracy of the record. Officials performing these duties are variously called, usually either auditor or controller (or comptroller); but these two terms are not consistently discriminated. Usually the duties of the legal auditor are to receive all claims, compare them with the provisions of law under which they are made, and determine whether warrants upon the treasury shall be issued. For example, municipal bonds are sometimes bad investments because auditors in passing upon the claims of the bondholders have discovered that the bonds were issued without adequate legal authority. An auditor for an administrative body classifies all expenditures that he has endorsed and keeps complete record of them on the basis of the legal warrant rather than on that of the purpose served, and so, as already suggested in another chapter, his accounts are largely independent of the accounts of heads of departments, and may show an entirely different set of figures.

How thorough shall be an auditor's examination of books is a matter for agreement between him and the persons employing him. In case of an attempt to learn whether fraud has been committed, the auditor is not expected to consider anything about the books other than the responsibility of the people suspected. The books may be well or ill kept so far as accounting principles are concerned, but it is not his function to advise; though naturally he would make some suggestions as a matter of professional interest. If, again, his opinion is desired merely on the method of accounting, to learn whether the figures have been correctly interpreted in figuring profit and loss, in keeping run of costs, etc., he need add no columns and

check no postings. His business will be rather with the classification of items and the method of drawing conclusions from the totals. If, finally, he is to report on the business of a corporation for its stockholders or other outsiders interested, his course is likely to be a sort of combination of those above, and yet a sort of compromise between them. He is not expected to add all the columns and to check all the postings, but to examine a sufficient number of sample cases to see that the proper methods of bookkeeping are carried out; and he is expected to study the general conclusions drawn from the accounts to see whether the proper methods of accounting have been applied.

Practically nothing that has been discussed in this book is beyond the field of the auditor's business. He is not only to examine matters of philosophical distinction that the mere bookkeeper knows little of, but he must know innumerable technical details. If he is working on a corporation report his knowledge of business should be so wide that he knows not only what methods of depreciation ought to be followed, but also what actual allowances are reasonable in this case. He must know, for instance, in shoe manufacturing, what rate of depreciation to allow on the different sorts of machinery, and on old stock. In the wholesale shoe business, he must know what allowances to make for old stock on the shelves and for bad bills receivable and bad accounts receivable. In the retail shoe trade, again, he must know what valuations he may use for the stock and for the book accounts. His knowledge should include all the common trades — hardly any two of which are alike. He must see that allowances are made for terminable values, such as patents, leases, premium on bonds, copyrights, etc. He must see that provision is made for debts due in the future, such as accrued interest, rentals, fees, etc. He must see that certain costs charged to capital are not too long carried there.

Each case of this sort, moreover, has a moral interest. As standing between the buyer and the seller of a business, the auditor must realize that any exaggeration of value or of earning capacity is unfair to the buyer, and *vice versa*, and he must prevent it. As between directors and stockholders, the auditor must realize that unless profits and assets are correctly reported the stockholder may be falsely induced to sell or the public falsely induced to buy; and his

task is to guarantee honesty. As between partner and partner, again, the same duty arises whenever a change in the terms of partnership is contemplated. Even when the business continues under the old management an auditor must see that each partner's contribution to the business is maintained as agreed by the articles of co-partnership. Auditing has come of late years to rank as a profession just because it requires not only a high quality of intellectual equipment and training, but a high sense of honor and of responsibility. Every part of accounting from the merest clerical drudgery to the most shrewd financiering should be so familiar to the auditor that he can protect not only the ignorant against the shrewd, but both against themselves. It is a common thing for an auditor to discover and disclose in business affairs conditions of critical importance of which the proprietors and bookkeepers had no inkling.

The first part of the report is devoted to a general  
 description of the country, its position, and its  
 resources. It is then divided into three parts, the  
 first of which is devoted to a description of the  
 country, the second to a description of the  
 people, and the third to a description of the  
 government. The first part is the most  
 interesting, and the most important. It  
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CHAPTER I

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## APPENDICES





## APPENDIX A

### ADDITIONAL FORMS OF BOOKS, TO SUPPLEMENT PART I

CERTAIN interesting forms not heretofore described are found in common use, and a study of some of them will help any one who wishes to master the principles connected with them. These are given less for their own sake than for illustration of the wide adaptability of the principles of labor-saving devices already explained.

#### *I. Certain Special Forms (for Books Described)*

Suppose a firm's entire business consists in selling goods on commission, as agent for two or three principals. If, in such a case, the agents guarantee payment for their sales, they make *bona fide* purchase of the goods which they sell, and the entry must show that fact. Credits on the purchase book will go to but two or three firms; and the credits to commission, naturally entered on the journal, will be as numerous as the purchases and will pertain to the same items. All sales, moreover, will pertain to the same items. A simple labor-saving device is to combine purchase and sales books, to give a special column in the combined book to each principal, and to allow in the same book a column for commission. Such a book might look as shown on page 288.

It is notable in this case that the abbreviation is extreme. One writing of items provides entry for a purchase, for a sale, and for the commission on that sale: if all purchases are made from two firms, fifty purchases, fifty sales, and fifty commissions can be covered in fifty entries and fifty-three postings — fifty postings for sales, two for purchases, and one for commission.

Another interesting device is one of those adopted often to enter merchandise discounts allowed for the early payment of bills. The simplest method, saving only the changing of books, was explained on page 66. Instead of writing each discount on the page of the cash book opposite the principal entry, as in the method just mentioned, the discount may be written in a special column on the same side — where it distinctly does not belong, — but with some indication that it is a counter entry; and at the end of the month, or other convenient period, the total may be transferred to the other side. That is to say, instead of making counter entries one by one, as by the method formerly described, by this method the counter entries are kept bunched in a special column on the wrong side and are at convenient seasons transferred to the side where they belong. By this method, too, one writing of the entry and one posting do the work done by two under the other method.

Such a cash book might look as shown on page 289.

Sundries		Sundries		Commission Cr.		Smith & Jones Cr.		Robinson Bros. Cr.	
Jan. 19	62	21	70	300.00	250.00	30.00	270.00	270.00	225.00
	✓		✓	2 doz. H. K. @ \$50	8 " M. K. @ 25				
				10 " M. K. @ 25					
						55.00			
						270.00			
						225.00			
						550.00			
							270.00		225.00

[The total of the first column is taken only in order that the test of debits and credits may be made, and only for that reason is the total for Smith & Jones and for Robinson Bros. brought into the second column to be added to the total of Commission. If a sales ledger were kept, the total of the first column would be the debit to Accounts Receivable, of course.]

Receipts

	Accounts Receivable		
	Total	Discount	
2,354.27			2,700.00
	600.00	30.00	
	400.00	20.00	
	1,000.00	50.00	1,000.00
			77.60
3,777.60			3,777.60
6,131.87			

Balance  
 Bills Receivable  
 B. Sykes  
 B. Patterson  
 Accts. Receivable  
 Discount (contra)  
 Cash, Dr.

Jan. 1 ✓  
 13  
 47  
 64  
 ✓  
 17  
 24  
 9

#67 Paid

Invoice, 12/1, 5%, Pd.  
 Invoice, 12/1, 5%, Pd.  
 Discount contra

Disbursements

	Accts. Payable		Expense	
	Total	Discount		
1,000.00	50.00			
246.00				
460.00	27.60		15.00	
				15.00
1,706.00	77.60			
				3,000.00
				15.00
				1,706.00
				50.00
				4,771.00
				1,360.87
				6,131.87

Adam Bede  
 H. Spring & Bro.  
 J. Judson  
 Expense  
 Bills Payable  
 Expense  
 Discount contra

Jan. 1 97  
 2 91  
 4 80  
 ✓  
 15  
 21  
 ✓  
 19  
 24  
 9

Accts. Payable  
 Discount (contra)  
 Cash, Cr.  
 Balance

[It will be noted that the discount is figured in total on the wrong side, and then transferred to the other side.]

## ACCOUNTS

## Disbursements

[For discussion, see page 292.]

		Accts. Payable		Expense
		Discount	Net Cash	
Jan. 1	97	50.00	950.00	
2	91		246.00	
4	80	27.60	432.40	15.00
	✓			
	15			
			1,628.40	3,000.00
		77.60	77.60	1,628.40
	24		1,706.00	
	19			15.00
	21			4,643.40
	9			1,300.87
				6,004.27

[It will be noted that in posting to individual accounts, the total of the columns "Net Cash" and "Discount" must be taken, to show the proper credit. (A third column might be provided for the total.) The cash book now balances as before; for under this plan the Receipts side, given on page 289, would omit the Discount contra (\$77.60) and would include only \$950 net cash on Accounts Receivable, thus giving a total of \$6,004.27, as we have it here.]

Disbursements

	Accounts Payable	Mdse. Cr.	Neglected Discounts	Expense	Net Cash
Invoice, Dec. 2, 5%	1,000.00	60.00	10.00		950.00
" Oct. 8	246.00	14.76	14.76		246.00
" Dec. 26, 6%	460.00	27.60		15.00	432.40
Postage					
#49 Paid					
Total	1,706.00	102.36	24.76	15.00	3,000.00
"					15.00
"					
					4,643.40
					1,300.87
					6,004.27

{For discussion, see page 292.]

Date	Description	97	91	80	15	21	19	11	24	9
Jan. 1	Adam Bede									
2	H. Spring & Bro.									
4	J. Judson									
	Expense									
	Bills Payable									
	Expense									
	Accounts Payable									
	Merchandise, Cr.									
	Neglected Discounts									
	Cash, Cr.									
	Balance on hand									

[It will be noted that this is not a pure cash book. Clearly the two items of \$14.76 in the second entry have nothing to do with cash. They simply transfer to Neglected Discounts an overcharge to Merchandise by the amount of the discount. In each case Merchandise is credited by the full discount offered, as explained on page 272; and in each case the selling firm is debited by the full amount of the bill. Only if some offered discount is not taken is a debit made to Neglected Discounts. The first entry shows some discount taken (\$59.00, the difference between the full amount of the bill and the net cash), and some lost. The discount taken does not need to be recorded separately, for it was originally charged excessively to Merchandise, and it is now, with the \$10.00 not taken, credited to Merchandise. The business does not need to know what it has saved by taking the discount, for properly the discount is no saving; on the contrary, failure to take the discount is definite loss.]

This cash-book page appears at first sight to show no balance of debits and credits; but a simple analysis will show its theoretical correctness, and a simple method of proof will test it. If the face of each account in the first column is paid, a debit is made to the seller, and the net cash column records the credit to cash; and the debit to Neglected Discounts and the credit to Merchandise offset each other, as in the second case. If less than the full face is paid, the difference is counterbalanced by the credit to Merchandise, as in the third case, or by the difference between the Merchandise and Neglected Discounts, as in the first case, in which the credits (Cash and Merchandise) are \$1010.00, and the debits (Accounts Payable and Neglected Discounts) are \$1010.00. The totals of the page show 1706.00 + 24.76 + 15.00 + 3000.00 (or 4745.76) = 102.36 + 4643.40 (or 4745.76). The credit to offset the Accounts Payable is always in Cash and in Merchandise. The credit to offset Neglected Discounts is always in Merchandise. Theoretically these entries to Merchandise and to Neglected Discounts do not belong in the cash book; but since they occur always in close connection with entries that do belong there, to put them there is a great convenience.]

The receipts side of the cash book would be arranged similarly, with Accounts Receivable instead of Accounts Payable, and Collected Discount instead of Neglected Discounts.]

Again, the same result is produced by a substitution of a column for "net cash" in place of the column for "total" as above. In this case the contra entry on each side of the cash book is avoided, for the amount of cash is reported correctly in the net-cash column. Care must be taken, however, as in the other case, that the discount be not included in the cash totals, and also that it gets posted.

The disbursements side of a cash book kept by this method might look as shown upon page 290 (reproducing the items of the last example).

One more illustration will serve to complete the suggestions for special-column usage. On page 270 of Part II will be found a discussion of reasons for entering merchandise discounts on a somewhat different basis from that commonly adopted. It is there suggested that discounts offered and not taken are of as much importance as those taken, and consequently should be reported accurately, and that the corresponding debits or credits should be made to merchandise account.

A method of recording such items is easily devised. It is necessary to note that when a discount is taken the buyer's or seller's account must be credited or debited, as the case may be; but when the discount is not taken an account called, perhaps, "Neglected Discounts" should be debited or one called "Collected Discounts" should be credited. A cash book to show such items might look as shown on page 291, assuming that in this trade 6% discount is allowed for payment in 10 days and 5% for payment in 30 days, and using the same items as before.

## *II. Certain Special Principal Books for Particular Needs*

The most interesting special forms of books are found perhaps in bank bookkeeping. Most banks have devices more or less peculiar to themselves, but the principles are usually the same. Everything handled by a bank in the ordinary course of its business is either money itself or a written claim to money which bears upon its face or on its back writing that sufficiently testifies to its source, destination, character, and presumable value. Hence usually in bank bookkeeping very few detailed entries are necessary. Banks accordingly can combine what in other businesses are purchase book, sales book, purchase ledger, and sales ledger, into one book — the so-called deposit ledger, or individual ledger. No advantage could be derived from entering in a journal, or purchase

book, deposits by patrons of a bank; for those deposits are either actual money or else claims for money which if ultimately proved worthless can be traced, by means of the endorsements, directly back to the depositor. The only record necessary is a debit to Cash and a credit to the depositor. If, then, the deposits for each day are entered in a special column, opposite the name of each depositor, the total of the column for the day is the debit to Cash, and the line devoted to each depositor, if so desired, can be used as a part of that depositor's ledger account. Of course the same principle may be used for withdrawals of money by checks paid. Such is the common practice. The result is the deposit ledger, of which the form on page 294 represents a part of a page.

Sometimes a special column is given for deposits in total, but that is usually unnecessary. Commonly cash deposits are made but once a day. When, however, a depositor has many transactions with his bank by the discounting and the collection of notes and drafts, such a column may be desirable, for in such a case one figure is to be taken from a deposit slip, and possibly others from the discount and the collection register. In the form shown, the amount of \$1,416.20, credited to James Robinson, on April 24, is put in italics (or it might be put in red ink) to signify that it was not a deposit of cash, but was allowed James Robinson for a note discounted, of which the proceeds were left on deposit.

In consequence of this form for the deposit ledger, the balance of each customer's account is figured and entered daily. The total of all balances should of course agree with the balance of the account representing depositors, or "Deposits," in the general ledger, — for Deposits in banking corresponds with Accounts Payable in commercial business.

In the case of so-called "inactive" accounts, such as accounts of persons not engaged in business, banks do not need to allow a set of columns for each day's record, and hence for the ordinary deposit ledger they substitute a similar form in which a page may be used for a month or longer. In these the columns are not designated for the same day for all depositors alike, but the date of each transaction is entered for each depositor independently of the dates for other depositors, as need may be.

It is thus clear that the deposit ledger in banking is, unlike other

## ACCOUNTS

	Thursday, April 23		Friday, April 24		Saturday, April 25	
	Balance	Checks Detail Total	Balance	Checks Detail Total	Balance	Checks Detail Total
A. Maple	140.00		340.00	115.00 25.00	200.00	
James Robinson	1,213.00	217.00 100.00 763.00	133.00	150.00 225.00 540.82	600.00 1,416.20	1,233.38
Silas Jones	219.10	57.80	161.30	400.00	238.11	.59



ledgers so far described, a book of original entry. No postings are made to it: on the contrary, postings may be made from it. It is a combined journal and subordinate ledger. From it figures must be taken to show necessary postings to Deposits and to Cash. Obviously, the total of the column headed "Checks total" must be debited to Deposits, for it represents what has been paid to depositors. Similarly it is a credit to Cash and hence may be transferred to the cash book — or journal, or day-book, as it is sometimes called in banking, since no other journal or day-book is necessary — at the close of the day. Obviously, too, the total of the column marked "deposits" should be credited to Deposits in the general ledger; but this total is not necessarily the correct debit to cash, for some of these credits to patrons are due not to deposits of cash, but to the discounting of notes and drafts of which the proceeds are left on deposit. If correct charge to cash is to be made, therefore, the deposits by discounted notes should not be included in that part of the total which is carried to the cash book. The deposits column of the deposit ledger may well have two footings, therefore, — the full total showing the desired credit to Deposits in the general ledger, and a total omitting deposits by discount but showing the debit to Cash. Thus, except for the unposted debit to Bills Receivable — the other half of our entry crediting depositors for discounted notes and drafts, — our entries are so far complete, with a debit for every credit. To post this figure of proceeds of discounted notes as a debit to Bills Receivable — or Bills Discounted, as the account is usually called in banking — would at best accomplish but in part the necessary debit posting to Bills Discounted, for the debit to Bills Discounted should be not only the proceeds of notes but the full face value. This debit can be conveniently made from the discount register.

The discount register is a book containing practically every detail that any one could wish to know about each note. The information is kept in columns containing, for each note, the name of the maker, the names of the endorsers, the place at which it is payable, the date, the length of time specified before payment, the date of maturity, the face value, the amount of discount, the amount of collection fee if any, the amount of net proceeds, and the name of the person for whom the bank discounted it. From the last two columns are transferred to the deposit ledger the proper credits to individual depositors, as already shown. The total of the other three columns of dollars and cents is clearly to be

posted. The total of the column for face values is simply the debit to Bills Discounted in the general ledger; the total of the column for discounts is the credit to Discount in the general ledger; and the total of the column for collections is the credit to Collection in the general ledger. Postings may be made accordingly.

One complication occurs in this book, however, similar to that occurring in the deposit ledger. Not all discounts are for deposit: some discounts are for cash, made to persons having no deposit account at the bank making the discount. So far as such discounts are made, the total of the column for proceeds of notes discounted is not necessarily a credit to depositors, but is in part a credit to Cash. Hence the two kinds of discounts must be distinguished (by red ink or back-slant figures, for example), and each must be taken in distinct total and posted to the proper account.

It may now pay to summarize these two books up to this point. The discount register, so far as it has been here discussed, represents this journal entry:

Bills Discounted	
	To Discount
	To Collection
	To Depositors
	To Cash

The deposit ledger represents these journal entries:

Depositors	
	To Cash

and

Cash	
Bills Discounted	
	To Depositors

The debit to Bills Discounted by a credit to depositors occurs in both books. In posting, Bills Discounted may be posted from the discount register, because there the figure is complete, whereas in the deposit ledger it includes only proceeds and does not include cash discounts and if posted thence would need to be supplemented by another posting for the omitted balance. Discount and Collection may also be posted from the discount register. The credit to Deposits would naturally be posted from the deposit ledger rather than from the discount register, for in

the deposit ledger the figure is complete, representing both kinds of deposits, whereas in the discount register it is but partial and would need to be supplemented by another posting for cash deposits. The only remaining postings to be made for these transactions are the credits to Cash for cash discounts, debits to Deposits and credits to Cash for cash withdrawals on checks paid by the bank, and the debits to Cash for the cash deposits. All these must in any case go to the cash book, and to post them thence is the natural process. A repetition of the journal entries given above with an indication of the disposition of the items may help the reader to see that everything is now provided for.

	Posted Directly	Transferred to	Whence already Posted
Discount register {	Bills Discounted	Yes	_____
	To Discount	Yes	_____
	Collection	Yes	_____
	{ Depositors (in deposit ledger) }	No	Deposit ledg.
	{ Deposits (in general ledger) }		_____
	Cash (proceeds only)	No	Cash book
Deposit ledger {	Deposits (in the general ledger)	No	Cash book
	To Cash	No	Cash book
	Cash	No	Cash book
	Bills Discounted	No	_____
	To Deposits (in general ledger)	Yes	_____
			Disc. reg.

It thus appears that each part of each item is either posted directly or transferred to another book whence it may be posted directly. The only complication that exists in posting, under the system thus far described, is due to the fact that both the discount register and the deposit ledger contain totals which must be split in two, the disposition of the two parts differing: in transferring cash discounts from the discount register to the cash book, care must be taken that the discounts for deposit be not included, else the credit to Cash will be excessive by the amount of such discounts for deposit; and in transferring cash deposits from the deposit ledger to the cash book, care must be taken that deposits by discount be not included, else the debit to Cash will be excessive by the amount of such discounts for deposit.

It is now to be noted that the amount likely to slip in by mistake in

each case, as just explained, is the same amount: it is the *discounts for deposit* in the discount register, and it is *deposits by discount* in the deposit ledger, — the same sum, in one book considered primarily as a discount and in the other book primarily as a deposit. It is to be noted, too, that incorrectly to include this sum in the total from the discount register is to *credit* cash excessively, and to include it from the deposit ledger is to *debit* cash excessively. Hence if *both* errors are committed, no balance of error remains. Most banks, therefore, on the principle already discussed on page 66, do not bother to separate cash-discounts from discounts-for-deposit in the totals of the discount register, nor cash-deposits from deposits-from-discount in the deposit ledger. The posting of such items may be made, then, not merely by direct posting to the ledger, but by transferring the total discounts from the discount register to the cash book as a debit to Bills Discounted and a credit to Cash, and transferring the total deposits from the deposit ledger to the cash book as a debit to Cash and a credit to Deposits. This is treating the transactions exactly as if every one who discounted a note for deposit withdrew the actual cash and then deposited it. Postings to the general ledger are made from the cash book in the usual course. This system, though it complicates the bookkeeping in theory, much simplifies the work of the bookkeepers in practice.

It is possible to carry this same sort of short-cut one step farther. We have just entered in the cash book two fictions to offset each other, and, as a consequence, we get rid of the necessity of posting from the deposit ledger at all; for now our total of deposits is in the cash book and can be posted thence as well as from the deposit ledger. So posting is simplified. With three exceptions, all figures to be posted are now conveniently handy in the cash book: these three are Bills Discounted, Dr.; Collection, Cr.; and Discount, Cr. We have in the cash book, however, as a cash disbursement, the proceeds of all bills discounted, though this figure is not to be posted thence. Now it happens that the difference between the face of bills discounted (or the proper debit to Bills Discounted) and the proceeds now appearing on the cash book is just the amount of the credits to Collection and Discount. If, then, we should carry to the cash book the amount of the face of bills discounted, instead of the amount of proceeds, and post this figure as a debit to Bills Discounted, and then should also carry to the cash book the totals of discount and collection, the cash would be overstated as much on one side

as on the other, and all would be well. Then all posting could be done from the cash book, and confusion in posting, partly from one book and partly from others, would be avoided. The process is simply another illustration of representing on opposite sides of the cash book two fictions that offset each other and might well be facts — as if certain money had been passed out at one window and taken in at another.<sup>1</sup> This is the method usually adopted.

In consequence of all this, the bookkeeping is in practice very simple. All totals in the deposit ledger, and all totals except proceeds in the discount register, are transferred directly to the cash book. It is now interesting to see the actual appearance of the books under this method of treatment. Let us assume the footings of a discount register to be as follows:

Face of Notes	Discount	Collection	Proceeds
\$83,297.10	\$517.62	\$15.24	\$82,764.24

<sup>1</sup> As a matter of fact, the contrary is usually true when discounts are made for cash. In banks large enough to employ considerable division of labor, the payment of cash for discounts is commonly through the medium of cashier's checks, and these, as it chances, are treated on the deposit ledger similarly to general deposits. The account called "Cashier's Checks," and two others of a like nature, "Certificates of Deposit" and "Certified Checks," are worth comment.

A certificate of deposit is issued when a depositor wishes not a running account subject to check, but a temporary account subject to withdrawal as a whole on presentation of the certificate. In that case no account need be kept on the books with the depositor as an individual, and all outstanding certificates may be lumped in one account. A credit to Certificates of Deposit when the deposit is made and the certificate is issued, and a debit when it is paid, serve the full purpose.

Certified checks are those upon which the bank has guaranteed payment, and they are therefore really accepted drafts. As soon as a check is certified, therefore, the account of the drawer must be debited and Certified Checks must be credited; that is, the credit or liability for the deposit is transferred from the account of the original depositor to Certified Checks. When the checks are paid, the account is debited.

Similarly, when a note is discounted and cash is desired, a cashier's check is issued ordering the paying teller to deliver the money. Cashier's Checks is credited, for the proceeds of the note have been deposited and until the check is paid, whether the time be ten seconds or ten weeks, the books should show a liability for the deposit. When the check is paid the account is debited, of course.

One's natural impulse is to think of these three accounts as having debit balances, for their names suggest outgo, but since in each case a liability for some sort of deposit antedates the issue of the certificate, the books should always show for them a credit balance if any are outstanding.

and the footings of a deposit ledger as follows:

Checks total	Deposits
\$80,149.36	\$76,327.19

So far as these items are concerned, the cash book would look as follows:

Receipts		Disbursements	
Discount	517.62	Bills Discounted	83,297.10
Collection	15.24	Deposits	80,149.36
Deposits	76,327.19		

All these items would be posted to the general ledger similarly to any other items.

The figures given above appear at first glance to show a rapid depletion of cash, but the full cash book would of course show large receipts of cash from the payment of matured notes previously discounted, — for the payment of which many of the checks here recorded as paid were probably drawn. The payment of these notes cannot be taken from the discount register, but must be entered independently, for in that book the notes are arranged in order of purchase and the payments of any one day could not be found in any one place. The other items of a bank cash book are likely to be self-explanatory.

Banks use, of course, many auxiliary books for convenience, such as the so-called ticklers (described in Appendix A, III) for rearranging the record of notes and drafts according to maturity — so that none shall be overlooked at the time provided for presentation to secure the liability of endorsers, — and the collection register, for recording notes and drafts entrusted to the bank for collection. The collection register differs from the discount register chiefly in the fact that the bank holds no title in paper for collection and hence makes no entry upon its principal books until collection is made; and then it merely credits the patron for whom the collection was made, as if the collection were a simple deposit.

Many banks keep their general ledger in the same form as that of the deposit ledger, and this method provides easy means for a daily trial balance. Postings may be made to such a ledger as easily as to one of the ordinary form, and as the balance is figured daily very little work is required for the construction of a trial balance. Indeed the ledger itself may be said to be a trial balance. This form is desirable, however,

only when changes are so frequent, in connection with most accounts, that the labor of bringing over new balances is worth while.

Many banks do not use the form of deposit ledger here shown, but one more like the ordinary ledger — though with an extra column for balances.

This discussion is intended not to treat bank bookkeeping exhaustively, but merely to show certain interesting types of device that may be applied in other connections.

### *III. Certain Common Auxiliary Books*

All the books that have been so far discussed may be called principal books, for we may say of each of them that if it is used at all no statement of the financial condition of the business and of its relation to outsiders can be made unless all items are taken into consideration and classified, or posted. Good bookkeeping has other purposes, however, than record of mere financial condition and personal relation. Numerous records of a statistical sort, and numerous memoranda to serve as reminders, are essential. Such books are usually called auxiliary, for figures from them do not usually affect the ledger or the balance sheet. So far as these books afford means of making allowances and estimates of value at the end of a year, however, they are important for balance-sheet purposes.

The most common of these books is the so-called bill-book, for recording the details of bills receivable and bills payable. Each note may well be given a number [as B. R. 167, B. P. 115] and then in the principal books detailed reference other than by number becomes unnecessary. Besides columns for recording the names of maker, payer, endorser, the date, the amount, the amount of interest, etc., of each note, these books provide a means of jogging the memory of a business man as to the date at which notes become due. The device in its simplest form consists of twelve columns, one for each month of the year, with room enough in each column to write a number to designate a day. On the line devoted to each note, therefore, an entry is made in the proper column to designate the day of maturity. A glance down the column shows on what days in any month notes mature, and a glance along the lines in which numbers occur shows which notes mature on those days. When days of grace are allowed, two numbers are used. Thus:

Jan.	Feb.	March	April
	23/26		
		11/14	
31			

When notes are numerous and danger of oversight exists in having many in the same column, two, three, or four columns may be provided for each month, headed: 1-15, 16-30; or 1-10, 11-20, 21-31; or 1-7, 8-15, 16-23, 24-31.

This sort of device may take many forms, and may be adapted to many uses. A common use besides that for notes payable and notes receivable is for accounts payable and accounts receivable. Where, as in many trades, large discounts are allowed for the payment of bills before certain dates, a shrewd manager will never allow one of those discount days to escape his notice. A book for accounts payable arranged on this plan is almost a necessity. As a means of watching the standing of customers, too, a book for accounts receivable is a great convenience.

In banks, where notes are likely to be very numerous, a different form of memorandum is usually adopted. In addition to the discount register and the collection register, described on pages 295 and 300, most banks keep a "discount tickler" and a "collection tickler," so-called, — designed to tickle the memory. In these ticklers, a space of several or many lines is provided for each day of the year, and as soon as a note is taken its record is entered in the space provided for the day on which it matures. Thus no excuse can exist for failure to present it for payment at the proper time.

Other common forms of auxiliary books are of a ledger type — such as order ledgers, stock ledgers, and stores ledgers. In an order ledger for manufacturing, for instance, all orders are entered as received, and as parts of the order are shipped entries are made to correspond; so that the book should show at all times just how much of any order has been filled and how much remains unshipped. Similarly, a stock ledger will be arranged by kinds of goods intended to be kept in stock, and all receipts of goods and all shipments will be entered under the proper heads; so that the amount of each kind of stock on hand will be always on record. A stores ledger serves a similar purpose, by similar method, for material and other supplies intended not for sale but for use.

Another type of stock ledger, sometimes called a "stockholders' ledger,"



is of interest. Antedating this is found usually at the inauguration of a corporation a book called the "installment ledger," of which, though various styles are in use, the chief purposes are sufficiently indicated by the forms below. Stock certificates, unlike bonds, are not usually issued to represent individual shares, but to represent holdings. A single certificate may represent one share or a thousand shares. Consequently a man holding a certificate for one hundred shares and wishing to sell fifty must surrender his certificate and have two new ones issued; one of these he can then transfer. When stock has been subscribed for but not yet paid for in full, the subscriber's account will have a debit balance because he owes the corporation; this shows in the installment ledger; but when his payment is complete, his balance is transferred to the credit side, on the stock ledger, showing the corporation's liability to him. Often stock is transferred when only some of the installments are paid. In such cases the original subscriber's liability for the rest of the subscription is acquitted, and the new subscriber accepts the responsibility, as shown on page 304.

## INSTALLMENT LEDGER

ROGER CHILLINGWORTH

723 Arthur Street, New Haven

Date	Shares		% Unpaid	Cert. No.		Date	Shares Trans.		% Unpaid	Cert. No.	Shares Paid	Inst. No.	%
Feb. 15	100	Subscribed	100		10,000	Mar. 1		Paid		2	100	1	25
Mar. 15	50	Jane Eyre	75	13	3,750	" 20	50	Surrendered	75	13			3,750
" 20	25	Reissued	75	18	1,875	" 20	25	Barry Lyndon	75	18			1,875
" 20	25	"	75	19	1,875	April 1		Paid		37	125	2	3,125

[The subscription is recorded as of February 15; on March 1 the first installment of 25% is paid; on March 15 a subscription of 50 shares, made by Jane Eyre, on which the first installment has already been paid, is transferred to this account; on March 20, 25 shares are sold to Barry Lyndon, by exchanging certificate #13 for two certificates and transferring one of them; on April 1, the second installment is paid on all subscriptions now belonging to this account. By adding the shares debited on the left side of the account and subtracting the shares in the shares-transferred column on the credit side, we learn the number on which responsibility remains. This gives one hundred twenty-five, on which, as we have seen, an installment was paid April 1. If, now, we compare total debits with total credits, we find a debit balance of \$6,250, or 50% on 125 shares, which is as it should be.]

# STOCKHOLDERS' LEDGER

JOHN INGLESANT

24 Shorthouse Street, Syracuse

Date	Shares	Cert. No.	Date	Shares	Cert. No.
Jan. 3	100	71	Jan. 1	1,000	1
5	1,000	1	2	100,000	71
	200	27	4	20,000	27
	1,100	91	5	110,000	91
			6	700	92
					93

APPENDIX A

100,000  
10,000  
20,000  
110,000  
10,000  
70,000

[The totals of principal columns show debits for 2400 shares and \$240,000, and credits for 3200 shares and \$320,000, giving a balance of 800 shares and \$80,000 ownership of capital stock.]

## APPENDIX B

### ADDITIONAL ENTRIES, TO SUPPLEMENT PART I

#### *I. Opening the Books of a Corporation*

A FEW peculiarities will be found in the opening of the books of a corporation.

The stockholders of a corporation, as already explained, do not usually appear by name upon its principal books. Hence credit is not given to them for their investment as it is given to a proprietor or partner. The account to represent stockholders is Capital Stock. When the capital of a corporation is invested in a lump sum in cash, the entry is simply

Cash	100,000	
To Capital Stock		100,000

Usually, however, subscriptions are called for, and these are often payable in installments. Strictly speaking, the corporation exists as soon as its capital stock, or a sufficient proportion of it, is subscribed; and those subscriptions are its resource, for they, like bills receivable, are promises to pay. Under such conditions, if the subscriptions are in lump sum, the first entry may be

Stock Subscription	100,000	
To Capital Stock		100,000

or, keeping the installments separate,

Sundries		
To Capital Stock		100,000
Stock Subscription Installment #1	50,000	
"                                    " #2	50,000	

Again, if some subscription is for immediate payment and some for installments, it might pay to use both subscription and installment accounts. For example:

Subscription	100,000	
To Capital Stock		100,000
 Sundries		
To Subscription		100,000
Cash	50,000	
Stock Subscription Installment #1	25,000	
"                    "          " #2	25,000	

In this last case, Subscription is now closed, for in part it has been paid, and in part it has been supplanted by another account.

When payment is made on subscriptions, Subscription or the appropriate installment account is credited, and Cash is debited. If notes are given for payment of installments, no installment accounts are necessary. If stock is issued only on receipt of the notes or cash, the subscription account may be made to register the amount of stock subscribed for and the amount actually issued: the debit balance to Subscription would of course represent the unissued stock subscribed for.

Any desired arrangement for recording the transactions can be attained by providing that Capital Stock be credited by all stock subscribed for or issued and that the accounts showing the property received in exchange for the stock be debited. The intermediate steps, such as accounts to show installments, subscriptions unpaid, stock subscribed for but unissued, etc., can be readily recorded by various combinations of the accounts mentioned and illustrated above. But always debits must equal credits, of course; and the distinction between debit and credit must be properly applied.

A serious complication from a bookkeeping point of view is always involved when stock is issued for less than par. Since the books must balance, the difference between par and the selling price must be made up by some entry on the debit side. Sometimes this is fictitious, consisting of nothing more than the capitalization of expected earnings. At other times it has a historical basis in the past prosperity of the concern.

When the capitalization is based on a recognizable good will of a former owner of a business, an entry may be made to cover that item. If, for example, a corporation succeeds a proprietorship, and the proprietor is given a share of stock representing, on account of the value of his reputation, more than the actual sale value of his merchandise, plant, etc., the books may well show the excess of stock as issued in payment for good will. Thus, if Joseph Sedley has a capital shown by his books to

the amount of \$50,000, and his average profit is \$10,000 (above compensation for his superintendence), it is obvious that his particular situation, or reputation, or combination of circumstances, affords him unusual opportunity for profit. Any corporation desiring to buy his business must pay for those advantages. Suppose it is probable that an additional capital of \$100,000 will enable the business to increase its earnings to \$18,000; *i. e.*, a new \$100,000 will earn \$8000 for itself, and still leave \$10,000 for Joseph Sedley. Ordinarily Sedley will not care to sell unless he can be assured of his \$10,000, and the corporation must give him enough stock to assure that income. Under such circumstances, if the corporation can show a prospect of paying 8%, it must issue to Sedley stock to the value of \$125,000 to induce him to sell. Even then he may find no inducement unless the probabilities of success are greater under the corporation than under the proprietorship. If he agrees to the sale, and the corporation takes over his business entire, claims, debts, stock, plant, etc., the only entries necessary are for the transfer of the proprietorship and the issue of stock. These would be as follows:

Good Will	75,000	
To Joseph Sedley		75,000
Estimated value of his business as a whole, in excess of the valuation of the property and claims		

When this is posted, the books show Sedley's credit to be \$125,000; for his present worth was previously shown to be \$50,000.

When subscriptions are asked for, Sedley's is treated like any one's else, included in the following (18,000 is 8% of 225,000):

Subscription	225,000	
To Capital Stock		225,000

Now when Sedley transfers the title to his business, and receives stock, the entry is simply

Joseph Sedley	125,000	
To Subscription		125,000

Now, on the ledger, Sedley's private account is closed; for his debits and his credits are equal. He no longer as an individual has interest in the business; his claim is as a holder of stock, and as such his name appears not on the general ledger, but only on the stock ledger — an auxiliary book showing who may vote at meetings and to whom dividends

shall be paid. The only reason that his name appears on the journal as a purchaser of stock, while no other stockholder's name need be entered on the general ledger, is that his payment for stock is by means of the surrender of a claim already entered against the business — which, of course, must be cancelled — while other subscribers pay new property into the business.

If, on the other hand, the corporation desires to pay but 5%, though earning \$18,000 per year, the capitalization must be increased to \$360,000. In that case, Sedley must be given at least \$200,000 in capital stock, and the other stockholders need pay but 62½% for their stock; *i. e.*, only \$100,000 in cash is wanted, and \$160,000 in stock will be issued for it. The entry for Good Will, therefore, will be \$150,000, and Sedley will be debited \$200,000 for stock; and the deficiency of \$60,000 between what the other stockholders pay and what they receive in stock is still to be accounted for. The balance is often provided for by deliberately “writing up” the valuation of the property on hand, *i. e.*, giving it a valuation based not upon the actual original cost or even the cost of duplication, but upon what it is considered to be worth as an earning machine under the peculiar circumstances under which in this case the various parts happen to be assembled. Usually such “writing up” is more or less concealed, some pretext or other serving as a “blind”; but good bookkeeping requires that it shall be clearly shown for what it is. In the case above mentioned, a natural set of entries would be as follows:

Good Will	150,000	
To Joseph Sedley		150,000
Estimated value of his business as a whole, in excess of the valuation of the property and claims		
Subscription	360,000	
To Capital Stock		360,000
Sundries		
To Subscription		360,000
Joseph Sedley	200,000	
Subscribed by him		
Cash	100,000	
Paid for shares at 62½% as follows: (Shown in detail)		
Plant	60,000	
Estimated increase in value of property, due to new facilities organized to-day		

In this last case, property formerly valued at \$150,000 — that is, Joseph Sedley's net capital of \$50,000, and \$100,000 paid in cash by the subscribers to stock — is made the basis for a capitalization of \$360,000. This increase of \$210,000 is simply capitalization of expected earning capacity based on (1) the actual recent earnings of Joseph Sedley's business, and (2) the expected extra profit of the enlargement of the business. The books show this increase of capitalization in two accounts, — (1) Good Will, which registers the valuation of Joseph Sedley's business above the net capital on his books, and (2) an increase in Plant, registering capitalization of the expected increase of the business from the enlargement. If anticipations are realized, it is in a sense true that the incorporators have by their new subscriptions contributed \$60,000 worth of plant to pay for their stock; for their combination has increased the productivity of the business by that much over and above the cash subscribed: so Plant is debited and Subscription credited exactly as Cash is debited and Subscription credited. Even this item Good Will might be eliminated by closing it out into the other accounts, writing them up, as already shown. This good will, though not tangible, inheres in tangible things, for the good will without the property is of no value. Only because the good will enables the plant, goods, etc., to produce more than otherwise does any one pay for it; and so property with good will attached is worth more than without it.

Theoretically neither good will nor the increased value due to combination of industry on a large scale should be hidden by guess-work distribution among other accounts. It would be better to open an account — called, perhaps, Appreciation — to show this \$60,000 discrepancy between par value of stock and the amount paid in. Both this and Good Will represent what is commonly called "water." No objection can be made to showing them except the very obvious one that it "lets the cat out of the bag." For that reason it is not commonly practiced. The aim of many accountants has been to conceal the facts where only experienced observers can find them. A discussion of the principles involved, with the argument for exact truthfulness, will be found in Chapter XIII.

Sometimes stock is sold at a discount not because the directors wish to keep low the rate of dividends, but because they wish by a low price to offer inducements for buyers. In such a case the stock is clearly speculative, and writing up the value of assets is indefensible. The correspondence between debits and credits is commonly brought about by



making debit entries, for the difference between the par value of stock and the price paid, to some account representing discounts. Such an account may show clearly its history, as when called "Stock Discount," or "Stock Rebate," or it may be a "blind" under a meaningless name. The former is the only defensible plan. In either case, of course, it should be wiped out as soon as possible from surplus earnings, by a credit to the account and a debit to Surplus; for until the amount of par of capital stock has been made up the capital is not what it is represented to be.

Similarly, premium on stock issued should be credited to a premium account, representing increased capital. This account should be closed not into Loss and Gain, but into Surplus; that is, it represents not earnings of the year, but accumulated extra capital, — available for use to earn more profits, just as are available earnings of past years left in the business as working capital.

*II. Another Method of Closing Books*

A method of closing books different from that shown in Chapter V is worthy of comment. In this method no transfers are made direct upon the ledger, but journal entries are made for each item carried from one account to another, and full details of inventories may be shown.

The method of closing an account with accrued items is as follows:

Dec. 31	20	Interest		700	
	25	To Loss and Gain			700
		To close, as follows:			
		Accrued credits			
		B. R.	#247   \$53		
			294   34		
			296   26		
			310   31		
			325   83	227	
		Accrued debits			
		B. P.	#49   15		
			54   48		
			72   64	<u>127</u>	
		Accrued credit balance		100	
		Net receipts, per ledger		600	700

When this item has been posted, the balance of the interest account will be \$100 on the debit side, properly representing \$100 that next year's business is responsible to collect. This result is the same as that attained by the method given in Chapter V, page 47.

Similarly, Merchandise, with a summary inventory, may be closed with the net profit carried to Loss and Gain and the inventory left as a balance for the new year, thus:

Dec. 31	11	Merchandise	30,000	
	25	To Loss and Gain		30,000
		To close, as follows:		
		Stock, dry goods	10,000	
		millinery	3,000	
		shoes	7,000	
		20,000		
		Credit balance, per ledger	10,000	

The posting of this item gives the account a debit balance for the new year of \$20,000 as on page 46.

It would be possible, of course, to split these entries and enter only the inventories or the accrued items in this way, crediting or debiting them by simple journal entries. Then the balance of net profit or loss could be transferred to Loss and Gain by the other method, as described in Chapter V.

Accounts having no inventory or accrued items attached may be closed into Loss and Gain by a simple debit or credit on the journal to transfer the balance.

In the case of Real Estate and Plant, if, as may happen, the bookkeeper wishes to keep an account to represent depreciation year by year, so that the amount can be found at a glance without picking it out from the various items of the real estate and plant account, two journal entries may be used. The first records the depreciation.

Depreciation	1626.00	
To Real Estate and Plant		1626.00

The second transfers the depreciation to Loss and Gain. When that has been done, Depreciation is closed, Real Estate and Plant shows the proper balance, and the loss is correctly reported; and the entries to Depreciation show in convenient form just what has been charged on that account each year. As many depreciation accounts may be distinguished as one may wish.

Finally, Loss and Gain is closed by journal entries which carry the balance to the proprietors or to dividends, or to surplus, or what not.

## APPENDIX C

### SINGLE ENTRY

THROUGHOUT this book double entry has been assumed as the only correct system of bookkeeping. The reason was explained in Chapter II. A few words about the single-entry system may be interesting, though they can serve little purpose except to emphasize the advantage of the other.

The fundamental distinction is that theoretically single entry has none but personal accounts. When a transaction involves two such accounts, the entry is necessarily double, a credit to one and a debit to the other. If, for instance, we owe Jones and pay him by an order on Smith who owes us, we must debit Jones and credit Smith. Theoretically, by single entry this would be made as two entries:

J. Jones,	Dr.	2,500
Paid him by an order on J. Smith		
J. Smith	Cr.	2,500
By an order to pay J. Jones for our account		

In practice, however, these are often combined as in a double-entry journal, though the double form intervening between single forms is more or less dangerous, since the bookkeeper may not notice that here two postings are required.


It is not strictly in accordance with the single-entry theory to keep accounts with property, such as merchandise and cash, though it is customary to do so.

When expenditures are for such things as interest, expense, etc., the normal entry would be to disregard the nominal account entirely and simply credit cash. If, however, one wished to keep track of interest, an account could be kept with it, posting to it as under the other system. Just so far, however, the system would be double entry.

Under pure single entry, therefore, the situation is as follows: the books show all amounts owing and all amounts owed; the resources of other

sorts may be counted or valued, as cash, notes, merchandise, etc. The difference between net resources and net liabilities is the present worth of the business — exactly as in the balance sheet by double entry. A comparison of this year's present worth with last year's present worth (allowing for any supposed profits withdrawn by proprietors or as dividends) shows profit for the year, — just as a comparison of two balance sheets (with allowance for supposed profits withdrawn) shows profits under double entry.

So far as single entry goes, therefore, it attains the same result as double entry. We must note, however, what is missing. In Chapter V we saw that by a six-column statement we derive profits by two methods, and that the two methods must show the same result. On such a statement we compare not only resources and liabilities, but also losses and gains. We know not only how much we have made and what it cost, but also from what sources we made it and how the cost was incurred. Single entry can do this, to be sure, by keeping extra accounts; but so far as it does so by single-entry methods double labor is involved. In double entry, as was shown in Chapter VI, the labor is not only not double, but practically single. Indeed, full double entry by double-entry methods is far less laborious than partial double entry by single-entry methods.



## APPENDIX D

### LOOSE-LEAF SYSTEMS

THE most recent improvement in bookkeeping methods, the so-called loose-leaf systems, has been very much advertised and widely adopted. In one sense there is very little to say about it on either side. It is not a new method of making entries, but simply a device by which sheets may be inserted or removed, somewhat as cards are treated in a library card-catalogue, and then locked into place so that no one without the key or combination can remove or insert any.

The great advantages are, of course, first, the removal of dead matter, so that no blank or closed pages need to be turned, and, second, bills may be made in duplicate and a copy inserted to save writing. There practically the advantage stops. The only objection to the system, on the other hand, is the rather obvious one that so far as substitution of new sheets for old ones is possible the books have lost much value as evidence in case of dispute. The possibility of substitution, however, is not so great as at first thought might appear. It has been noted in the discussions of Part I that commonly an item is included in totals which are carried from book to book, ending usually in the ledger, and the ledger total or balance is likely to be included in the trial balance or balance sheet. The substitution of a new incorrect page for an old correct page — that is to say, forgery — would be likely to suffer exposure as a result of any effort to trace it through the books; for the falsified figures would probably be included in many totals or give rise to many balances on many different pages. Only a substitution of new pages for all those affected by the change would prevent the discovery of the forgery; for each of these changes would probably involve new ones and so the process would go on in a practically never-ending chain, — except for matters of very recent occurrence. Practically rewriting the whole set of books would be necessary to make successful the forgery of a matter several months old. Yet, of course, sometimes that would be quite as well worth while as any forgery is worth while. When it comes to that, however, any set of bound books may be replaced by a new set. The possibility of detection in that case

depends upon the fact that the books would be obviously new, whereas under the loose-leaf system the individual pages do not usually show much wear.

One sort of entry, however, is very much open to the danger of forgery under the loose-leaf system. Journal entries are usually important and usually they are independent of other entries. That is to say, they are not usually included in totals as are figures on the cash book, sales book, purchase book, etc. To substitute a new false journal page for an old one would be easy, and corresponding ledger pages could also be easily substituted, so that the forgery would be hard to detect. For this reason it is common to use a journal in the old-fashioned bound form.

The only other considerable danger in the use of the loose-leaf system is that some detail may be written and substituted for the correct detail, where no change in ultimate amount is involved; for since only totals and balances are carried through a set of books, changes in detail by forged substitution could not be detected. That is to say, if the dispute were not about the value of goods, but about the nature or quality of the particular goods ordered or shipped, substitution would be easily possible.

These objections, it should be clearly understood, are meant to imply not that many business houses would condone forgery, but that they wish their books to be so constructed that forgery shall be practically and obviously impossible. They wish to avoid not merely evil, but the possibility and the appearance of evil.

For auxiliary records, such as ticklers, detailed cost analyses, etc., the loose-leaf systems (or card systems) are extremely valuable. An office force using them, however, must be trained to extreme care in handling the loose elements, for the misplacement of a sheet or a card is usually equivalent to the loss of it.

## APPENDIX E

### THE TREATMENT OF PETTY ACCOUNTS AND PETTY ITEMS

IN the text of Part I no mention was made of what are commonly called "petty accounts." These are of a minor sort not requiring a separate space for each in the ledger, and yet needing at least temporary record. For them it is customary to keep one or more accounts in the ledger called "Petty Accounts," to represent the whole number, or a whole set, of such individual accounts. The distinction between the amounts belonging to different individuals is made by writing the name as a part of each posting. Balancing is accomplished by providing that each debit or credit shall be posted opposite its corresponding credit or debit, leaving blank lines, when necessary, to allow for this. A sample general-ledger page might look as follows:

#### PETTY ACCOUNTS

1907					1907			
Nov. 7	H. Smith	29	17.50		Oct. 10	H. Smith	17	17.50
					21	J. Jones	19	219.00
Dec. 2	A. Browne	32	22.00					
21	D. Jones	39	164.00		Dec. 12	D. Jones	35	164.00

A common device is a so-called "petty cash book," maintained not for items belonging to Petty Accounts, but for general items too insignificant to burden the general cash book. Sometimes money is placed in lump sum in the hands of clerks or agents for disbursement as occasion may require, with the condition that they shall keep detailed cash books. Petty Cash account is debited on the cash book when the money is delivered; and that account is credited on the journal, with a debit for the total of the items belonging to each disbursement account, when the agent's report is made. Sometimes, on the other hand, a petty cash book is maintained in the counting room and from it items are entered on the general cash book only in totals, at convenient intervals, for each disbursement account.

A modern development of the device of Petty Accounts is what is

called the "voucher system," though this has come to be extended to accounts that are not petty. This substitutes for the general ledger account of the other system an account called "Vouchers Payable." In the handling of items for this account two books are usually kept, the voucher book and the vouchers payable register.

The voucher book consists of what are practically bill-head forms bound together so as to be detachable from a printed stub. As soon as a purchase is made, a form, with its attached stub, is filled out. The form shows all details of the transaction (unless it is so complicated that an invoice number may well be cited instead), and the stub summarizes the transaction with the additional statement of how the items are to be treated on the books of the paying firm. For illustration, if a department store is to pay an advertising bill, the voucher will be filled out, in detail, to be sent to the publishing office with the payment, and the stub will have corresponding information summarized with the additional statement of how the charge is to be divided among the different departments. When the voucher is sent, a request is made that it be signed as a receipt and returned. If it does not return in due season, the stub serves as a record, — just as do check-book stubs. The presence of a voucher undetached in the voucher book indicates that the bill has not been paid; so the book stands as a whole for debts outstanding.

The voucher register is written directly from the voucher book, showing totals and allocations of expenditure somewhat as shown on page 319.

At the end of each day or week or month the totals of the column for amount are posted to the credit of Vouchers Payable in the general ledger and the amounts of the separate department totals are debited to their proper accounts. Some items may need to be posted individually if no special columns are provided. When payments are made, Vouchers Payable is debited in the cash book. So the credit balance of this account in the general ledger should always agree with the undetached vouchers in the voucher book and the unpaid items in the voucher register.

With some business houses the use of vouchers is carried so far that they take the place of the common form of bank check, for the vouchers contain a clause ordering a bank to pay the bill. This is convenient for the counting room, for the receipt in the form of the check endorsement is then on the bill itself and no dispute as to the particular items covered by it can possibly arise. Such bulky forms of check are extremely inconvenient for banks, however.



To Whom Issued	No.	For Bill		Paid		Amount	Re- turned	Departments						
		Date	Terms	Due	When			How	Vegetables	Fruit	Dairy	Produce	Misc.	Produce
Marcus Mark	710	Ju 1	10 ds	Ju 11	Ju 11	Cash	14.10	✓	Produce	Misc.	9.50	Produce	Misc.	4.00

To use the complete voucher system for all payments, as some firms do, is to scatter badly the transactions with one concern instead of keeping them together in the general ledger; and so it can be recommended only for temporary or for occasional items. The use of the voucher itself for all payments seems rather like system gone to seed, for ordinary receipts, receipted bills, and endorsed checks, are in practically all cases receipt enough. The only advantage of this extra receipt is that of uniformity for filing purposes.

## APPENDIX F

### FORMULÆ

IN many of the following formulæ several differing expressions for the same thing have been given. When good tables of interest, discount, etc., are at hand, simplified formulæ are desirable; but when such tables are not available, only the most detailed formulæ are serviceable. The most condensed form is usually given first.<sup>1</sup>

*To find the amount (principal and interest) of a sum at compound interest for a number of periods*

Let  $P$  = the principal sum

$r$  = the rate of interest per period

<sup>1</sup> For those not familiar with algebraic expressions, it may be necessary to offer a few explanations. Two symbols written side by side on the same line without a sign between them are always to be multiplied together; thus,  $aP$  means the amount of  $a$  multiplied by the amount of  $P$ .  $Pa$  is the same thing as  $aP$ , of course. A parenthesis includes all within it as one item subject to the same treatment throughout; and hence  $P(a+1)$  means that  $P$  is to be multiplied not only by  $a$  but also by 1, giving  $Pa+P$ , not  $Pa+1$ . When two symbols are written as a fraction, the upper is to be divided by the lower; thus  $\frac{Ud}{r}$  means that  $U$  is to be multiplied by  $d$  and the product divided by  $r$ . A small figure or symbol written at the right and above another indicates that the latter is to be multiplied by itself as many times as the number indicated by the former: thus,  $a^2 = a \times a$ ;  $a^3 = a \times a \times a$ ;  $(a+b)^2 = (a+b) \times (a+b)$ , or  $a^2 + 2ab + b^2$ ;  $a^p = a \times a \times a \times a$  etc. as many times as there are units in  $p$ , so that if  $a=3$  and  $p=4$ ,  $a^p = 3 \times 3 \times 3 \times 3$ . A similar small figure written in fractional form means that the corresponding root is to be taken, — that is, a number is to be taken which when multiplied by itself the required number of times will produce the required amount; thus,  $a^{\frac{1}{3}}$  = the cube root of  $a$ . Since in any equation the two halves are equal, as  $6+4+7=9+3+5$ , any sum may be subtracted from either side if a corresponding sum is subtracted from the other side, or such sums may be added, or both sides may be divided by the same sum, or both sides may be multiplied by the same sum: thus, if  $A=1+r$ ,  $A-1=r$ , and  $A+1=2+r$ ; if  $A=Pa^p$ ,  $\frac{A}{P}=a^p$ , and  $\frac{A}{a^p}=P$ ; and if  $M=\frac{Ud}{r}$ ,  $Mr=Ud$ .

$a$  = the amount of one dollar for one period (one plus the rate<sup>1</sup>)

$p$  = the number of periods

$A$  = the amount of the principal for the specified periods

In one period the amount of one dollar will be  $1+r$ . Since interest is here compounded annually, in the second period the sum at interest is  $1+r$ , and at the end of the period it will be not only intact (that is, multiplied by 1), but increased by  $r$  times itself (that is, be multiplied by  $1+r$ ). For two periods, then, the amount of one dollar is  $(1+r) \times (1+r)$ , or  $(1+r)^2$ . In the third period this amount is again increased by  $(1+r)$  times itself, or becomes  $(1+r)^3$ . So for any number of periods  $1+r$  must be raised to the power corresponding with the number of periods, or  $(1+r)^p$ . Since by our supposition  $a = 1+r$ , the amount of one dollar for any number of periods is  $a^p$ . Then  $Pa^p$ , or the amount of one dollar multiplied by the number of dollars of principal, will be the required sum, the amount of the specified principal for the specified periods at the specified rate.

**Formula I.**  $A = Pa^p$

*To find what principal will amount to a given sum at compound interest in a given number of periods*

This problem is simply the reverse of the last. If  $P$  becomes  $A$  when multiplied by  $a^p$ , then  $A$  must become  $P$  when divided by  $a^p$ ; or, to express it mathematically, if the principal multiplied by the amount of \$1 gives the amount accumulated by the principal in a number of periods, the amount desired divided by the amount of \$1 must give the principal required. We have already seen that the amount of \$1 for any number of periods is  $a^p$ .

**Formula II.**  $P = \frac{A}{a^p}$

*To find the present worth of a sum payable at a stated time in the future*

This is similar to the last problem except that we have slightly different names for the same figures. In the last case, the principal was the sum invested at the beginning of the time. Here the purpose is to learn the present value of a principal that is payable only after a lapse of time, as, for example, the face of a note or a bond. What in the last case we

<sup>1</sup> The rate, of course, though usually spoken of as if it were units, as 3, 4, 5, etc., is really hundredths. Thus a rate of 3 is mathematically .03. So one plus the rate is in that case not 4, but 1.03, which is the amount of one dollar for one year.

called amount, then, becomes here the principal, and what was principal becomes here present worth.

Let  $W$  = the present worth.

$$\text{Formula III. } W = \frac{P}{a^p}$$

*To find the compound interest*

Here the problem is simply to subtract the principal, or initial investment, from the total sum accumulated, or amount.

Let  $i$  = the compound interest of one dollar for the periods specified

$I$  = the compound interest of the principal sum for the periods specified

Then, by the explanation given for Formula I, we get

$$\text{Formula IV. } i = a^p - 1$$

$$I = A - P \text{ or } P(a^p - 1)$$

*To find the compound discount*

This is related to discount as the fourth formula is related to interest. The discount is the principal minus the present worth.

Let  $d$  = the compound discount of one dollar for the periods specified

$D$  = the compound discount of the principal sum for the periods specified

Then, by the explanation for Formula III, we get

$$\text{Formula V. } d = 1 - \frac{1}{a^p}$$

$$D = P - W \text{ or } P - \frac{P}{a^p} \text{ or } P(1 - \frac{1}{a^p})$$

*To find the amount of an annuity*

The mathematical characteristic of an annuity is that the sum at interest is changing arbitrarily and independently of exact relation to the interest rate. Hence a constantly changing principal is involved in the figuring.

Let  $U$  = the number of dollars in each annuity payment (sometimes called the rent of the annuity)

$N$  = the amount (total annuity payments plus accumulations of interest on payments reinvested or available for reinvestment) of a specified annuity for the periods specified

$n$  = the amount of an annuity of one dollar for the periods specified

An annuity will accumulate as follows:

Period	Annuity received	Interest earned by Prior Annuities	Total received Each Period	Amount
1	$U$	—————	$U$	$U$
2	$U$	$rU$	$U+rU$	$2U+rU$
3	$U$	$2rU+r^2U$	$U+2rU+r^2U$	$3U+3rU+r^2U$
4	$U$	$3rU+3r^2U+r^3U$	$U+3rU+3r^2U+r^3U$	$4U+6rU+4r^2U+r^3U$

This process might be continued indefinitely, but no formula can be constructed from it alone unless we know the number of periods. We desire a formula for all periods.<sup>1</sup> If we now take another annuity that shall give for a part of its history a table corresponding to the table above, we shall be able by comparing the two tables to derive a general formula. Let us take an annuity of  $U+rU$ , that is, an annuity not only as large as the first but larger by one year's interest on the first. For this annuity, the table for four years is as follows:

Period	Annuity received	Interest earned by Prior Annuities	Total received Each Period	Amount
1	$U+rU$	—————	$U+rU$	$U+rU$
2	$U+rU$	$rU+r^2U$	$U+2rU+r^2U$	$2U+3rU+r^2U$
3	$U+rU$	$2rU+3r^2U+r^3U$	$U+3rU+3r^2U+r^3U$	$3U+6rU+4r^2U+r^3U$
4	$U+rU$	$3rU+6r^2U+4r^3U+r^4U$	$U+4rU+6r^2U+4r^3U+r^4U$	$4U+10rU+10r^2U+5r^3U+r^4U$

<sup>1</sup> The method to be followed is so complicated that the reader may find help in a sort of check-list following the course of the argument. For that reason an abbreviated outline is given here, in order that as the reader progresses he may mentally check up his advance.

$$\begin{aligned}
 \text{Am't ann. } rU &= \text{am't ann. } (U+rU) - \text{am't ann. } U \\
 &= \text{last income ann. } (U+rU) - \text{first income ann. } U \\
 &= U+rU + \text{comp. int. on } (U+rU) \text{ for periods } (p-1) - U \\
 &= rU + \text{comp. int. on } (U+rU) \text{ for periods } (p-1) \\
 &= \text{comp. int. on } U \text{ for } p \text{ periods} \\
 &= Ui
 \end{aligned}$$

$$\text{Am't ann. } U = \frac{Ui}{r}$$

Having now two annuities operating on the same basis, we can determine the amount of an annuity equal to the difference between them by subtracting the amount of one from that of the other; for the amount of annuities must vary exactly as the amount of their principals. The last sum in each table is the amount of the annuity specified. If the larger of these is subtracted from the smaller, the difference is the amount of an annuity of  $rU$ ; for Amount of annuity of  $U + rU$  — Amount of annuity of  $U$  = Amount of annuity of  $rU$ . Then Amount of annuity of  $rU = 4rU + 6r^2U + 4r^3U + r^4U$ .

It happens, moreover, that this sum just obtained is exactly the difference between the last income of the larger annuity and the first income of the smaller, or, as can be seen from the table,  $U + 4rU + 6r^2U + 4r^3U + r^4U - U$ . This is not a mere coincidence. A little analysis shows it to be inevitable, however many the periods. We chose for our larger annuity a sum larger than that of the smaller by the amount of a year's interest. So the first income of the larger annuity must be the same as the second income of the smaller — for the smaller will receive in a year what the larger receives at the start. This relation must continue regularly between the two tables; for the larger annuity is always ahead by the amount of one year's accumulation of interest on the smaller. The amounts of the two annuities, then, will correspond except to the extent of the first income of the smaller (which the larger never gets) and the last income of the larger (which the smaller never gets). This will be true, moreover, for any number of periods; for since all items in the tables except the first and the last cancel each other, the determining element is that last period, however long or short the series may be. A reference to the tables will make this clear.

We have remaining, then, in order to find the amount of an annuity of  $rU$ , only to find a formula for the last income of  $U + rU$ . Let us analyze this last income. It consists of the periodic payment of the annuity, or rent, plus the last earning of interest on accumulations. The earning of interest on accumulations for the last year, however, must be related to compound interest on the annuity. This can be shown by a brief analysis. The last earning of interest is as follows: one year's interest on the last annuity payment, one year's interest on the previous annuity payment combined with the accumulated interest of the year before, and one year's interest on the first annuity payment combined with the accumulated interest of two years. This, however, is the same as

compound interest for three years — or for one period less than the elapsed time of the annuity — on one annuity payment. A table will show this. Since here we are after an illustration and not a formula, we may well use figures, assuming an annuity of \$104, at 4%, for four years.

*Amount of an annuity of \$104, for four years, at 4%*

Year	Annuity	Interest Earning	Total to add	Amount
1	\$104	—————	\$104	\$104
2	104	\$4.16	108.16	212.16
3	104	8.4864	112.4864	324.6464
4	104	12.985856	116.985856	

*Compound interest on \$104, for four years, at 4%*

Year	Amount at Beginning of Year	Interest	Amount at End of Year	Compound Interest
1	\$104	\$4.16	\$108.16	\$4.16
2	108.16	4.3264	112.4864	8.4864
3	112.4864	4.499456	116.985856	12.985856

The reason for carrying the figures through a smaller number of periods in the compound-interest table is, of course, that an annuity begins to earn interest only at the end of the first year; for nothing is due until then, and then only the first annual rent is received.

We have found, then, an easy means of figuring the last income of the larger of our two annuities, that is, that for  $U + rU$ ; for we have found it to be the rent, or  $U + rU$ , plus the compound interest of one year's rent for periods  $(p - 1)$ . Let us summarize our process up to this point. The amount of an annuity for  $rU$  is the last income of an annuity of  $U + rU$  minus the first income of an annuity of  $U$ . The former of these we have just seen to be  $U + rU$  plus the compound interest of  $U + rU$  for one period less than the time involved; and the latter of these is simply  $U$ . This may be expressed as follows: Amount of annuity of  $rU = U + rU$  plus compound interest of  $U + rU$  for periods  $(p - 1)$  minus  $U$ . The two  $U$ 's cancel. We have left to find only  $rU$  plus the compound interest of  $U + rU$  for periods  $(p - 1)$ .

It happens that our value of  $U + rU$  is purely fictitious, for the expression has no part in our real problem: our task is to find the amount of an annuity of  $U$ , and we found  $U + rU$  only as a step on the way. If, then, we can find a constant relation between the compound interest of  $U + rU$  and that of  $U$ , we shall have our formula in terms of given values. Such a constant relation obviously does exist, and must be of the same sort as



that which we found to exist between the amounts of their annuities.  $U+rU$  when earning compound interest starts at the point which  $U$  attains in one year, and its amount is always one year in advance. Since the compound interest is always the amount minus the principal, however, the interest of the smaller sum will in four periods be greater than that of the larger sum in three periods by the difference in principals; for from the amount of the smaller sum for four periods (which is the same as that of the larger sum for three periods) a smaller principal is subtracted, and so the remainder is larger by that amount. A table, to be compared with the last table given, illustrates this by the use of a principal of \$100.

Year	Amount at Beginning of Year	Interest	Amount at End of Year	Compound Interest
1	\$100	\$4.00	\$104.00	\$4.00
2	104	4.16	108.16	8.16
3	108.16	4.3264	112.4864	12.4864
4	112.4864	4.499456	116.985856	16.985856

The compound interest of \$100 is for any period more than that of \$104 for the preceding period by just the amount of difference in principal between them; that is, \$100 gives for four periods \$16.98, which is \$4.00 more than the \$12.98 given by \$104 for three periods; and this is so because of the amount of \$100 at the end of the fourth year all but \$100 was earned as interest, whereas of the amount of \$104 at the end of three years \$104 must be subtracted to find the interest. Now the difference between these two sums of compound interest, being the difference in principal, is exactly the difference between  $U$  and  $U+rU$ . We found some time ago that we could use the compound interest for  $U+rU$  in determining the amount of an annuity of  $rU$ , and hence of  $U$ . It would now be far more to our purpose if we could use the compound interest of  $U$ , however, for our problem is concerned with  $U$ . We were going to use the compound interest of  $U+rU$  for periods  $(p-1)$  plus  $rU$ . Now we find that the compound interest of  $U$  for  $p$  periods is exactly the same as that of  $U+rU$  for periods  $(p-1)$  plus  $rU$ . Here, then, is exactly what we want.

The amount of annuity of  $rU =$  compound interest of  $U$  for  $p$  periods. Since both amounts and interest vary directly as the principals concerned, our equation can be expressed as follows:

Amount of annuity of  $U = \frac{\text{compound interest of } U \text{ for } p \text{ periods}}{r}$

$$\text{Formula VI. } N = \frac{Ui}{r} \text{ or } \frac{U(a^p - 1)}{r} \text{ or } \frac{Ua^p - U}{r}$$

$$n = \frac{i}{r} \text{ or } \frac{a^p - 1}{r}$$

This very long and elaborate working out of the problem may be very briefly stated in algebraic form as follows:

Amount of annuity of  $U = U + Ua + Ua^2 + Ua^3 + Ua^4 + \dots + Ua^{p-1}$

Amount of annuity of  $Ua = Ua + Ua^2 + Ua^3 + Ua^4 + Ua^5 + \dots + Ua^p$

Amount of annuity of  $(Ua - U) = Ua^p - U$

Amount of annuity of  $U(a-1) = Ua^p - U$

Amount of annuity of  $U = \frac{Ua^p - U}{a - 1}$

$$N = \frac{Ua^p - U}{r}$$

*To find the present worth of an annuity*

This problem may be worked out on the same basis as the last. Since the principle is the same, only substituting present worth for amount and discount for interest, we do not need to analyze it in detail.

Briefly, the present worth of an annuity of  $U$  for any number of periods is made up of the present worth of each of the annual installments of  $U$ , and the present worth of an annuity of  $U + rU$  is the present worth of the annual installments of  $U + rU$ ; and the present worth of an annuity of  $rU$  is the difference between the present worths just mentioned, — or the present worth of the first income of the large annuity minus the present worth of the last income of the small annuity. This last difference, by Formula V, is the same as the compound discount on  $U$  for  $p$  periods.

Let  $m$  = the present worth of an annuity of one dollar

$M$  = the present worth of an annuity of a specified sum

The present worth of an annuity of  $rU$ , then, may be expressed as follows:

$$rUm = Ud$$

$$Um = \frac{Ud}{r}$$

Formula VII.  $m = \frac{d}{r}$  or  $\frac{1 - \frac{1}{a^p}}{r}$

$$M = \frac{Ud}{r} \text{ or } \frac{U - \frac{U}{a^p}}{r}$$

The actual method of deriving this is, without explanation, as follows:

Present worth of annuity of  $U = \frac{U}{a} + \frac{U}{a^2} + \frac{U}{a^3} + \frac{U}{a^4} + \dots + \frac{U}{a^p}$

Present worth of annuity of  $Ua = \frac{Ua}{a} + \frac{Ua}{a^2} + \frac{Ua}{a^3} + \frac{Ua}{a^4} + \dots + \frac{Ua}{a^p}$  or

$$U + \frac{U}{a} + \frac{U}{a^2} + \frac{U}{a^3} + \frac{U}{a^4} + \dots + \frac{U}{a^{p-1}}$$

Present worth of annuity of  $Ua - U = U - \frac{U}{a^p}$

but, by supposition,  $Ua - U = rU$

Present worth of annuity of  $rU = U - \frac{U}{a^p}$

$$M = \frac{U - \frac{U}{a^p}}{r} \text{ or } \frac{U(1 - \frac{1}{a^p})}{r}$$

but  $1 - \frac{1}{a^p} = d$

$$M = \frac{Ud}{r}$$

This may be derived in still another simple way. The amount of an annuity we have already found by Formula VI to be  $\frac{U(a^p - 1)}{r}$ . The

present worth of the annuity is the present worth of the amount of the annuity. Formula III gives us  $W = \frac{P}{a^p}$ . In the case before us,  $P$  is the amount

of the annuity, or  $\frac{U(a^p - 1)}{r}$ . Then  $\frac{U(a^p - 1)}{r a^p}$  is the present worth

of the annuity. Then

$$M = \frac{U - \frac{U}{a^p}}{r}$$

*To find what annuity, or sinking fund, will amount to a given sum*

This merely reverses the problem of Formula VI. If an annuity of one dollar will amount to  $n$ , the desired number of dollars divided by  $n$  will show the number of dollars in the annuity desired.

$$\text{Formula VIII. } U = \frac{N}{n} \text{ or } \frac{N}{\frac{a^P - 1}{r}} \text{ or } \frac{Nr}{a^P - 1}$$

*To find what investment will buy a given annuity*

This is simply the problem of the present worth of an annuity. Since, by Formula VII,  $M = \frac{Ud}{r}$ , and  $M$  is in this problem the principal to be determined, we substitute  $P$  for  $M$  and get

$$\text{Formula IX. } P = \frac{Ud}{r} \text{ or } \frac{U\left(1 - \frac{1}{a^P}\right)}{r}$$

*To find what annuity a given sum will buy*

This, too, is a problem in the present worth of an annuity. Here our given sum, or  $P$ , is the same as the present worth, or  $M$  of Formula VII. If the present worth of an annuity of one dollar is  $m$ , the present worth of the unknown sum will be  $P$  divided by  $m$ .

$$\text{Formula X. } U = \frac{P}{m} \text{ or } \frac{P}{\frac{d}{r}} \text{ or } \frac{Pr}{d} \text{ or } \frac{Pr}{1 - \frac{1}{a^P}}$$

*To find the yield of a bond purchased at a given price*

As was stated in Chapter XII, no method has been discovered for finding in all cases the exact yield of a bond by figuring backward from the known price — unless a rate of interest on assumed reinvestments is to be taken for granted. To assume a rate on reinvestments different from that on the principal is obviously to put aside the thing one is trying to learn. By such a process a part of the yield of the investment is made to depend on the rate arbitrarily chosen for reinvestments. Even when this method is used for purposes of comparison it is misleading if the ratios of reinvestment to principal are different in the two cases. What an investor really wishes to know is usually the rate paid on investments of this class; and that assumes returned premium to be either reinvested in securities of the same class or else not reinvested at all. The only method of determining

this is approximation, as described in Chapter XII. When one assumes a different rate for reinvestments, however, a formula may be derived by algebra with the aid of logarithms to determine the average yield — not the yield of the original investment. This method compares the purchase money, or cost, with what it will amount to at the end of the time, and so determines the rate of increase.

Let  $y$  = the rate paid nominally by the bond

$r$  = the rate assumed for reinvestments

$x$  = the rate to be found

$W$  = present worth, or cost, of the bond

$P$  = the face of the bond

The amount of the bond at maturity will be made up of the face value, or  $P$ , plus the amount of the interest (an annuity for  $yP$  compounded at the rate  $r$ ). We may now apply Formula I — in which  $P$  becomes for this problem  $W$  and  $a$  becomes  $1+x$ , — and Formula VI — in which  $U$  becomes  $yP$ . We get, then,

$$W(1+x)^p = P + \frac{yPa^p - yP}{r}$$

That is to say, the present worth of the bond at compound interest equals the face value plus the amount of the annual interest payment that it provides (the amount of an annuity). Then

$$\begin{aligned} (1+x)^p &= \frac{P}{W} + \frac{yPa^p - yP}{rW} \\ 1+x &= \left\{ \frac{P}{W} + \frac{yPa^p - yP}{rW} \right\}^{\frac{1}{p}} \\ x &= \left\{ \frac{Pr + yPa^p - yP}{rW} \right\}^{\frac{1}{p}} - 1 \end{aligned}$$

Such an equation can be resolved only by means of logarithms, of course. For illustration, if  $y = .04$ ,  $r = .035$ ,  $P = 100$ ,  $W = 114$ , and  $p = 26$ , the formula would be applied as follows:

$$x = \left\{ \frac{3.5 + 4(1.035)^{26} - 4}{.035 \times 114} \right\}^{\frac{1}{26}} - 1$$

By logarithms:  $\log. 1.035^{26} = \log. 1.035 \times 26 = 0.01494 \times 26 = 0.38844 =$   
 $\log. 2.4459.$

$$2.4459 \times 4 - .5 = 9.2836; .035 \times 114 = 3.99; 9.2836 \div 3.99 = 2.3262.$$

$$\log. 2.3262 \frac{1}{28} = \log. 2.3262 \div 26 = 0.36665 \div 26 = 0.01410 = \log. 1.0330.$$

$1.033 - 1 = .033$ , the desired rate.

*To find for depreciation a steady percentage on last valuation that will reduce to a fixed scrap value*

Let  $P$  = the cost

$S$  = the scrap value

$x$  = the rate of depreciation

$w$  = the percentage which each new valuation bears to the last, —  
 that is,  $100\% - x$

$p$  = the number of years

The series of valuations will then run as follows:  $P, Pw, Pw^2, Pw^3$ , etc., for as many periods as the years indicated. The last, or scrap value, then, will be  $Pw^p$ .

$$\text{Then } S = Pw^p; \frac{S}{P} = w^p; \left(\frac{S}{P}\right)^{\frac{1}{p}} = w; \left(\frac{S}{P}\right)^{\frac{1}{p}} = 100 - x; x = 100 - \left(\frac{S}{P}\right)^{\frac{1}{p}}.$$

Since  $S$  and  $P$  are given, the root may be extracted by logarithms.

$$\text{Formula XI. } x = 100 - \left(\frac{S}{P}\right)^{\frac{1}{p}}.$$

To apply this to the problem on page 256

$$S = 20, P = 200, p = 5.$$

$$x = 100 - \sqrt[5]{\frac{20}{200}}$$

$$\frac{20}{200} = .1$$

$$\log. \text{ of } .1 = \overline{1.00000}$$

$$\div 5 = \overline{1.80000}$$

natural number corresponding = .63095, or 63.095%

$$100 - 63.095 = 36.905$$

The desired percentage, then, is 36.905.

*To find a bank reserve*

Many devices for constructing an intelligible and easily figured statement of reserve have been adopted. For our purposes here intelligibility is of more consequence than facility. The difficulties in the way of figuring the amount of reserve have been already suggested in Chapter XVI. The work will be done here, therefore, with the minimum of explanation.

Since the amount not only of absolute reserve but also of proportion of cash reserve differs with the class of city in which a bank is located, two forms are necessary to cover the field. As far as that is possible we shall use the same figures for both conditions, so that the differences shall be evident.

We may well begin both statements with the report of the relation of the bank in question with other banks not reserve agents, for in some conditions, as previously explained, this affects the amount of deposits to be covered by reserve. Next we may deduct from the liability for reserve all direct sums allowed to be deducted from the deposits before the liability for reserve is calculated, such as clearing-house items, redemption fund, etc. Then we shall be ready to apply our formulæ for determining what reserve is required.

These formulæ are derived on the following plan. Since in banks not in reserve cities the reserve must be fifteen per cent. of the amount of deposits, of which three-fifths may be on deposit with reserve agents, the requirement for reserve is met if the lawful cash is six per cent., and the deposits with reserve agents are nine per cent. The problem, as explained in Chapter XVI, is to know how much of the excess deposits with reserve agents, if any, may be counted to reduce liability for reserve in the matter of sums due to other banks. To express this in another way: the reserve with reserve agents, less any excess over the countable 9%, must be 9% of the total deposits less such excess; for the excess reduces the amount upon which the 9% is taken; but the excess does not reduce deposits to be covered except as it can reduce sums due to banks.

Let  $a$  = gross deposits

$b$  = sums with reserve agents

$x$  = amount with reserve agents in excess of the amount allowed to count on the 9% basis (but countable at 100% against deposits by banks only)

$$\begin{aligned} \text{Then} \quad b - x &= \frac{9}{100}(a - x) \\ 100b - 100x &= 9a - 9x \\ 100b - 9a &= 91x \\ x &= \frac{100b - 9a}{91} \end{aligned}$$

For banks in reserve cities, on the other hand, since the total reserve must be 25% and cash must be one-half, our proportion of reserve countable on the widest basis is 12½% or  $\frac{1}{8}$ . Our equation then becomes

$$\begin{aligned} b - x &= \frac{a - x}{8} \\ 8b - 8x &= a - x \\ 8b - a &= 7x \\ x &= \frac{8b - a}{7} \end{aligned}$$

Now we are ready to apply these to some practical conditions. Suppose our balance sheet shows the following items: due to banks, \$235,000; due from banks not reserve agents, \$212,000; clearing-house items, \$186,000; national bank notes, \$19,000; redemption fund, \$3000; deposits, \$2,392,000; due from reserve agents, \$285,000; lawful cash, \$294,000.

For a bank not in a reserve city the statement would work out as on page 335.



*Calculation of Reserve for a Bank not in a Reserve City*

<i>Schedule A</i>		<i>Schedule B</i>	
Due to banks	\$235,000	Clearing-house items, etc.	\$186,000
Due from banks not reserve agents	212,000	National bank notes	19,000
Bank deposits to cover	23,000	Redemption fund multiplied by 6 $\frac{2}{3}$	20,000
Individual deposits, etc.	2,392,000	Deductions	225,000
	2,415,000		
Deductions (Schedule B)	225,000	<i>Schedule C (applying formula)</i>	
Gross deposits to cover	2,190,000	Due from reserve agents	285,000
Available excess (Schedule C)	23,000	multiplied by 100	28,500,000
Net deposits,	2,167,000	Gross deposits multiplied	
15% =	325,050	by 9	19,710,000
$\frac{2}{3}$ (6% — cash required) =	130,020	divided by 91 = (excess)	96,593
Lawful cash on hand	294,000	Excess available to offset	
Cash excess	163,980	deposits from banks	23,000
		Unavailable excess with re-	
		serve agents	73,593

If the accounts with banks not reserve agents had showed a balance on the other side, the amount would have been disregarded altogether; for it would have represented neither a deposit with the bank nor a sum available as reserve to cover deposits. If, on the other hand, it had been on the same side as now but larger in amount, more of the excess with reserve agents would have counted and thus have reduced the requirement of cash; for since under these conditions the sum due to other banks was only \$23,000, only \$23,000 of the \$96,593 of excess with reserve agents was allowed to count at all.

It will be noted that the custom of applying the redemption fund to deposits before the reserve is figured distinguishes between this fund and the other lawful money counted against deposits. The other lawful money covers on the 6% basis, for 9% may be covered by deposits with reserve agents. The redemption fund, on the other hand, covers only on a 15% basis, for no deposits with reserve agents are included in the reserve for the amounts so covered. Thus this method provides an actually greater cash reserve than would be provided if the redemption fund were counted with the other lawful money.

Now let us apply the same figures to a bank in a reserve city.

*Calculation of Reserve for a Bank in a Reserve City*

<i>Schedule A</i>		<i>Schedule B</i>	
Due to banks	\$235,000	Clearing-house items, etc.	\$186,000
Due from banks not reserve agents	212,000	National bank notes	19,000
Bank deposits to cover	23,000	Redemption fund multiplied by 4	12,000
Individual deposits, etc.	2,392,000	Deductions	217,000
	<u>2,415,000</u>		<u>217,000</u>
Deductions (Schedule B)	217,000		
Gross deposits to cover	2,198,000		
Available excess (Schedule C)	11,714	<i>Schedule C (applying formula)</i>	
Net deposits	2,186,286	Due from reserve agents	285,000
25% =	546,571	multiplied by 8	2,280,000
$\frac{1}{2}$ (12 $\frac{1}{2}$ %—cash required)	273,286	Gross deposits	2,198,000
Lawful cash on hand	294,000		82,000
Cash excess	20,714	divided by 7 = (excess)	11,714
		Excess available to offset deposits from banks	11,714
		Unavailable excess with reserve agents	0,000

It is common to enter deficiency as well as excess in the statement of relations with reserve agents. This, of course, is not a real deficiency; for the law does not require a bank to keep any of its reserve on deposit with reserve agents. So the term deficiency in that use is only a convenient designation for a figure of no real consequence. Such deficiency is always to be offset, of course, by a cash excess; but a cash deficiency cannot be offset by any bank excess.

Deficiencies actual as well as nominal are not uncommon in time of financial pressure. The Comptroller may, after due warning, close a bank failing to maintain the required reserve, but he does so only when the condition is evidence of permanent distress. To close all banks showing deficiency in times of tight money would precipitate a widespread and disastrous panic.

Figuring the reserve by the formulæ given above becomes necessary only when the limit is approaching. In both cases given in detail above a glance makes it evident that the cash reserve is so much in excess of the required 6% or 12 $\frac{1}{2}$ % that the sums with reserve agents are ample to cover the remainder of the requirement.

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