Studies in Accounting Theory

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Introduction to the First Edition

WE who study or teach accounts are sadly handicapped by a shortage of good reading. Textbooks we have in plenty; most are sound and many are long. In general they deal competently with the mechanical side of our subject. But gaps exist even here; and when we turn from mechanics to principles the gaps become large indeed. What is more, such material as does exist is not always easy to lay hands on, often taking the form of essays scattered through the old files of British and American periodicals which few of us can readily consult.

Accordingly the Association of University Teachers of Accounting is sponsoring a series of volumes in which useful articles will be reprinted. This, the first, covers general accounting. Later issues may deal with costing and other branches of our subject.

Choosing the articles has not been easy, and I apologise to all authors and readers who feel that I have botched the matter. Many omissions will I hope be readily understood in the light of the preceding paragraphs; my task has not been to compile an anthology of all that is best in accounting, but to fill gaps with material that is hard to come by. Thus the omission of an article does not necessarily mean that I do not admire and recommend it. If it is easy of access, it is disqualified. Happily a good deal of serviceable reading is now coming into better supply, and several much-quoted authors have recently published volumes of their collected writings.

The chosen essays fall into two types. One group deals with professional matters; these will, I think, be of practical service in both classroom and office. But for the most part the essays have a more academic flavour. We start with a few that are concerned with the history of accounting; I should have liked to include more, so that students might see our subject in perspective, and realise that some of its limitations are due to a rather haphazard growth; but the dearth of material is here very striking. Others are intended to give background to studies of company law and management; Mr. Yamey's able contribution on dividend law, written in his very early twenties, may also serve to show students that they need not despair of infusing order into material that obviously baffles their teacher—in Mr. Yamey's case, me. The remaining essays illustrate the basic theory of accounting.

I must plead guilty to one form of bias in making my selection: I have let myself be swayed as much by manner of telling as by content. The warmest admirer of accounting could, alas, scarcely claim that its writings are in general either graceful or sprightly. A

most unfortunate tradition has grown up that soundness must be dull. But why? Accounting theory is exciting stuff; and there seems to be no good reason why our writers should suppress their high spirits or turn a deaf ear to style. I have tried to find the exceptions —the men who show that here, as elsewhere, an author should strive to bring out all the life in his subject, and may on occasion give vent to his sense of fun or write with tongue in cheek.

However, it is not merely bad style that renders some of our writing dreary. It is also the absence of scepticism and controversy —without which accounting can never make a good academic discipline. True, if an author is describing the best ruling for a petty cash book, or how to transmute bill of exchange transactions into double-entry, then he has not much scope for spirited debate. Yet as soon as we pass from the elementary and technical parts of our subject we are confronted with countless difficult points of principle —indeed, almost every important branch of accounting still lacks an adequate theoretical basis. Our textbooks never call attention to this intellectual poverty. Nor do they give any hint that, where a step forward has been made, it has often been accompanied by controversies at once animated and entertaining, and on occasion unpleasantly heated. (One might almost risk the assertion that, if an article has not attracted outraged protest, it has not contributed much of merit.) Without such controversies, we are not likely to find the answers to our problems.

The battlefields of conflicting theory provide the best training-ground in abstract reasoning that accounting can offer to students. I have therefore been at some pains to include essays that stress the main points of controversy or adopt unconventional attitudes; in one or two cases, the essays form symposia, in which antagonists set forth the *pros* and *cons* of a debatable issue, and try to demolish one another's cases. It follows that I cannot possibly subscribe to all the views that are voiced. Still less can my fellow members of the Association of University Teachers of Accounting—who have shown their kindness by making helpful suggestions, but have left me complete freedom of choice—be held responsible for contributors' opinions. In some cases indeed the contributors themselves now tell me that time has modified their views; I have however persuaded them that the crude vigour of youth is more likely to stimulate class discussion than the tepid wisdom of maturity. Where the arguments strike me as false or exaggerated, I have assumed that the students' work in orthodox textbooks will supply sufficient corrective, and further that the occasional reading of subversive doctrines is good for the liver.

If the collection may be likened to an art exhibition, I may perhaps claim that it includes sample pictures from all the main modern schools, both extreme and traditional. Can one detect any common note among the artists' somewhat jarring attitudes? I think

so. Accounting grew up as a technique for recording what has happened; our figures are histories—records of receipts, payments, and the like. So long as such figures are not asked to do much more than afford evidence of faithful stewardship, they are very adequate. But are they still adequate for more delicate tasks—for determining income, for settling production policies, for measuring the rights of shareholders? Almost all the writers answer "No!" And this is not merely a pose by our wild young men. The same feeling is to be found increasingly among trusted leaders of the profession; for instance, a talk by Mr. G. O. May includes these remarks:

> If we are going to say that all we can do is just to take the dollars in and out, and that is all there is to it, and if we are not going to interpret the significance of what is happening—then we are resigning ourselves to a position as hewers of wood and drawers of water, and we relinquish the goal that accounting hopes to attain—a position of a highly professional receptiveness to new ideas and a great social usefulness.

One can detect two main causes for the falling prestige of historic figures. First come the ups-and-downs of the price-level, with which a substantial group of essays is concerned. The drop in the value of money during the post-war inflation has been so precipitate that it was bound to affect our thinking. Asset values based on cost may conjure up the best available picture when the price-level is stable, but hardly pass muster when costs have altered substantially. Where such values also affect income figures—and so tax—the repercussions of our concept have been widespread and unpleasant. *The Times* estimates the overstatement of profits in British industry for 1939–49 at no less than £2,500 million—£1,000 million being due to the time-lag error in charging stocks to "production" on a cost basis, and £1,500 million to the same error in the measurement of depreciation.[1] Normally we accountants counter our critics, when we are driven into an awkward dialectical corner, by insisting that the need for caution and prudence overrules all niceties of logic; the post-inflation embarrassments of industry have turned the tables on us and given this cherished argument to our adversaries.

But another attack was already in progress long before inflation came to trouble us. The whole concept of historic cost as a basis of value—even in times of price stability—had already been challenged. At one wing of the attackers was a group of theorists, fresh from their reading in economics, and anxious to demonstrate that value is a function of future benefits rather than past outlays. The other wing was composed of accountants bent on belittling the balance-sheet and elevating the revenue account. Possibly this group of accountants—which includes most of our leading writers—was the more influential in undermining accepted notions. One can readily

[1] *The Times*, March 24, 1949.

comprehend their attitude. Their daily work, and especially their negotiations with income tax officials, would predispose them to attach more and more weight to revenue figures. Further, they recognise that a balance-sheet is unlikely to show "values," in the sense of, *e.g.*, a current market value or a subjective value to the owner; and so they tend to dismiss the balance-sheet as a mere appendage of the revenue account—a mausoleum for the unwanted costs that the double-entry system throws up as regrettable by-products. Is this argument sound? If figures for wealth at the beginning and end of a period are meaningless, then can the figures for changes in that wealth—*i.e.*, the revenue account—mean anything? And, if so, what?

It may well be that this dispute is not so formidable as it first appears, and springs largely from differences in the use of words. Some people distinguish sharply between "cost" and "value" (possibly endowing the latter word with a great deal more precision than it can ever in fact possess). Others use "value" as a handy generic term covering a number of allied concepts, such as original cost, replacement cost, current selling price, subjective value, and so on. There seems much to be said in favour of this second attitude. What we seek is a practical measure for wealth. When regard is paid to difficulties of precise definition, to expense and trouble of calculation, to the needs of objectivity and familiarity of concept, then none of the measures can be regarded as perfect; original cost certainly does not get full marks, but its score may well be higher than those of its rivals—provided that its nature is plainly stated, that the price level has not changed much since the expenditure was made, and that the figures are not to be used for purposes for which they are not intended.

In saying this, I am but repeating a commonplace. Most observable phenomena can legitimately be measured in several ways, with widely differing answers. None of these may be "right"—indeed all may suffer from grave defects. But one method may be less unsatisfactory for some given purpose than its fellows. Your skilful statistician is he who shows ripe judgment in selecting the least bad measure for the job on hand.

The critical attitude of the essays may thus, I think, be regarded as reassuring. Accountants are coming to appreciate the limitations of their data, and to suggest alternative methods. The proffered cures take several forms. A number of contributors want us to correct original cost by substituting another "conventional" value, in which original cost is exalted or abased at the tail of some price index. Mr. MacNeal's exhilarating attack sweeps aside any remedy that stop short of wholesale re-appraisal. And Professor Edwards pleads f a forward-looking approach in which the valuations of both capi and income depend on the composite future receipts of the wh firm rather than historic data and separate figures for each asset

If I were bold enough to criticise the critics, I should try to show that each makes out a reasonable case for using his favourite concept of value in particular circumstances, without explaining fully its limitations in other circumstances. Thus the stock market probably does use the forward-looking approach in arriving at share prices; but I doubt profoundly whether this would be a practical basis for determining income tax assessments or dividend policy; again, somewhat different considerations apply if the just price of munitions is being calculated, or if a firm is paying out the widow of a deceased partner. In short, the *occasion* for making the valuation is all-important. You must not choose a value without first knowing what you are going to use it for.

The essays therefore suggest that the good accountant of the future will be an expert in valuation. I do not for one moment suppose that he will ever be competent to appraise grandfather-clocks or feeding-stuffs or mineral seams; he will be well advised if he continues to leave the appraisal of separate assets—particularly physical assets—to specialists. But, if he is to give his maximum service to his fellow-men, he will have to be ready and able to value much more elusive things: costs, incomes, shares, partnership rights, whole enterprises, and so forth. This implies, I submit, that he must understand the different concepts of value, and know which concept is most serviceable for the task of the hour. He will of course need a much fuller training in theory, particularly economic theory, than most of us have enjoyed in the past.

When the chairman of a meeting does not quite know how to extricate himself from his opening remarks, he usually takes refuge in some such formula as: "And now, ladies and gentlemen, let me no longer stand between you and your speakers." The words have perhaps lost their original freshness, but the idea is as good as ever. An editor, however, cannot very well move a vote of thanks on the last page of his book, and I must do so now. We—readers and sponsors of the book alike—are deep in debt to the authors of the essays, and to the owners of the journals from which they are culled, for granting leave to republish. In not a single case was my request refused, and consent was always ready and courteous. Further, I have as editor been given much help and advice by publishers, contributors, and colleagues (notably Mr. David Solomons and Mr. H. C. Edey); and I am most grateful.

And now, ladies and gentlemen, let me no longer. . . .

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September, 1950.

Introduction to the Second Edition

THE introduction to the first edition of *Studies in Accounting* stressed the shortage of good, readily available reading on accounting topics. This problem still confronts us, though we hope the deficiency has been alleviated, in the areas of costing and the history of accounting, by publication of a volume of *Studies* in each of these fields. In the area of financial accounting, or accounting theory if you will, much that is new and instructive has been published in widely scattered places in the dozen years since the first edition appeared. This second edition is an effort to bring together some of the recent material that we feel is outstanding but not readily available. We also include a few of the essays from the first edition that continue to be helpful; and, where published work did not provide exactly what was wanted, we have commissioned new articles.

Several changes from the general arrangement of the earlier volume seemed desirable. First as to name: *Studies in Accounting Theory* is more aptly descriptive, and also serves to delineate this volume more clearly from the others in the series. The editing has been a joint Anglo-American enterprise. We found it relatively easy to agree on what was worthwhile in accounting writing—which testifies to the similarity of developments on both sides of the Atlantic. Although this was not a criterion in the selection process, it is an interesting fact that there are an equal number of items drawn from American and from British sources.

Perhaps the most significant change in this edition is the increased diversity of source material. Seven of the essays were written specifically for us. Two of them are concerned with the relationship of economics and accounting. Most of the remaining five deal with new developments in related topics that impinge heavily upon accounting theory. In selecting items to reprint, we have ranged further afield than previously; contributions have been drawn from sources that seem far removed from the main stream of accounting thought —the *Political Quarterly*, a U.S. Congressional hearing, and a book on economic planning in Eastern Europe. Journals in accounting, business, and economics furnished the bulk of the other material.

In preparing this volume, we have benefited from the advice and aid of colleagues, contributors and many others. The authors of the essays and their publishers were again uniformly generous in agreeing

to publication. By their comments—candid, and sometimes brutal—our colleagues have helped us to winnow the mass of accounting writing and reduce the size of this volume to its present still rather bulky form. We are grateful. We regret having been forced at times to make an arbitrary choice between equally attractive articles, and to leave out much that we admire. For such omissions, and other faults, we assume all responsibility.

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January, 1962.

STUDIES IN ACCOUNTING THEORY

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An Historical Defense of Bookkeeping*

By Henry Rand Hatfield

Deceased, sometime Professor of Accounting, University of California.

I AM sure that all of us who teach accounting in the universities suffer from the implied contempt of our colleagues, who look upon accounting as an intruder, a Saul among the prophets, a pariah whose very presence detracts somewhat from the sanctity of the academic halls. It is true that we ourselves speak of the science of accounts, or of the art of accounting, even of the philosophy of accounts. But accounting is, alas, only a pseudo-science unrecognized by J. McKeen Cattell; its products are displayed neither in the salon nor in the national academy; one finds it discussed by neither realist, idealist nor phenomenalist. The humanists look down upon us as beings who dabble in the sordid figures of dollars and cents instead of toying with infinities and searching for the elusive soul of things; the scientists and technologists despise us as able only to record rather than to perform deeds.

We suffer perhaps in silence, even, as Carlyle says, "consuming our own choler as some chimneys consume their own smoke," perhaps in public denying that we suffer at all, but here—in a meeting not of accountants, but of university instructors in accounting—we can admit among ourselves that at times this academic attitude does get under our skins.

The contempt for accounting is not limited to university circles, but is well-nigh universal. It is evidenced by ignorance of the subject, by condescension towards its devotees, by their exclusion from polite literature.

And how abysmal that ignorance! I give two instances. The university speaker who said, "If you do so and so your ledger (speaking figuratively, of course) will show a debit balance." Would he have spoken of an equation with unequal members? And the distinguished writer in the October *Atlantic*,

* *An Historical Defense of Bookkeeping* originated as a paper read before the American Association of University Instructors in Accounting on December 29, 1923. It was first printed in *The Journal of Accountancy*, April 1924, Vol. 37, No. 4, pp. 241–253.

thesaurus of culture, supposedly barred to academic solecisms, who says, " In most sections of America the fact that a man or woman has been divorced . . . is something to be set down . . . on the debit side of the account," ignorant that likely as not a debit (as for instance in the bank account) means the imputation of additional value—which I take it is quite contrary to what Mrs. Gerould intended.

But the contempt for accounting is even more clearly shown by a constantly repeated phrase, a phrase which of all phrases is to me the most exacerbating—because of the combination of ignorance and supercilious condescension. This phrase, which I could quote from uncounted sources, is: " That is a mere bookkeeping entry." One might as well say, " That is a mere algebraic equation," or, " That is a mere statement of discovered fact," or " That is the formulation of a mere axiom." Mere truth, mere fact, mere sanctity, mere virtue. Do you wonder that I lose my temper every time I see the phrase? Of course one may make a misstatement in bookkeeping, just as one may lie either in Greek or in German: but that merits some adjective more individious than " mere."

And remember how accounting has been slighted in literature. The public eye has generally, both in history and in fiction, been turned on the man on horseback, but nevertheless at times there comes upon the stage a more prosaic figure. Great masterpieces have grouped themselves about a scholar as Faust, about a carpenter as Adam Bede, about a manufacturer as in *Les Miserables*, about a sailor as Robinson Crusoe, about courtesans, thieves and beggars beyond recital. Even a horse and a dog have been made the heroes in *Black Beauty* and in *Rab and His Friends*. But never, so far as I recollect, has a bookkeeper been made the hero of novel, play or poem. The bookkeeper is not even honoured by being made a noteworthy villain.

Long ago Sir Roger de Coverley assumed that " little that is truly noble can be expected from one who is ever poring on his cashbook or balancing his accounts." Literature has maintained this attitude ever since, and the bookkeeper has reached his apogee in the gentle and pathetic figure of Tim Clerkenwell. Compare him for a moment with the military hero. The latter appears mounted on a horse, leading, to the music of bugle and drum, his martial columns in charges against the foe, brandishing a reeking sword, and wearing on his brow the victor's wreath of laurel. The bookkeeper too is mounted, but on a quadrupedal stool, he too marshals columns, but of figures to the accompaniment of a clicking Burroughs, his charges are those on the debit

side of the ledger, his brow is encircled by a green eye shade, he brandishes only the humble rival of the sword, guiltless doubtless of his country's blood, and incarnadined only with Carter's cardinal ink.

But it is not good for a man's soul always to suffer under the inferiority complex. Let us no longer bear in humility the lash of contumely. Let us face our contemners, be they classicists, philosophers or scientists.

> " No matter if he is a houn',
> They gotta quit kicking my dog aroun'."

Let us boldly raise the question whether accounting, the late claimant for recognition as a profession, is not entitled to some respect, or must it consort with crystal-gazing, sociology, chiropractic, pedagogy and palm-reading.

Three elements, if not conclusively proving, at least presumptively establish, respectability. These are, first, parentage and lineage; second, the company one keeps; and third, the services which one renders the community. Let us examine accounting in these aspects.

Without raising the question as to accounting in antiquity, we look upon the Franciscan monk Paciolo as the father of modern accounting, as his *Summa*, published in 1494, which was the first printed work dealing with algebra, also contained the first text on bookkeeping, a slender tractate entitled *De Computis et Scripturis.*

Not much can be said of Paciolo,[1] aside from his writings, but his academic credentials are flawless. He was an important if not a great mathematician. His first appointment to teach in a university was at Perugia. In less than a year his request for an increase of salary was granted. The reason stated in the official records has a singularly modern sound. It reads: " because he has already taught for two months and has shown himself to be a man of highest learning, and because it appears that he manifestly cannot live on such a meagre stipend." Again in less than six months he was promoted, this time with a more permanent tenure as well as increase of salary. Soon afterward he left the university, probably devoting himself to the study of philosophy and theology. He returned to Perugia in 1487, and while he had previously signed himself " Brother Luke," in his later writings he was wont to describe himself as a " humble

[1] H. Staigmuller, " Lucas Paciuolo, eine biographische Skizze," in *Zeitschrift für Mathematik und Physik*, Bd. 34, Historisch-literarische Abtheilung, pp. 81–102, 121–128.

professor of sacred theology." He held many other university positions, at various times teaching at Naples, at Pisa, at Florence, and at Bologna. He ended his career with his highest honour, for in 1514 Pope Leo X appointed him professor of mathematics in the *Sapienza* at Rome, a position in the "university of the highest standing in all Christendom."

In 1496 he was called to Milan by the reigning duke, Ludovico il Moro, whose court was a center of light and learning, and to be established there was a signal honour. Adams in China, Hollander in Porto Rico, Bogart in Persia, Paciolo in Milan—all indications of deserved recognition of professorial eminence—all doubtless to be kept in mind for at least 427 years.

At Milan, Paciolo was brought into contact with many prominent persons, the most significant being Leonardo da Vinci, perhaps the most eminent man of his day. Between the two there grew up an intimate friendship. Da Vinci himself tells that he hastened to buy a copy of Paciolo's *Summa* as it came off the press, and he collaborated with Paciolo on a later book, the *Divina Proportione*, for which Paciolo furnished the text and da Vinci the illustrations. Honour indeed for a university professor! Would not the most eminent mathematician of today rejoice if the greatest man of his time, say Roosevelt or Henry Ford, had hastened to buy one of his treatises (even though it contained the adventitious attraction of some chapters on bookkeeping)? Would not even one so eminent as William James have been flattered if in his psychology the somatic reactions of the emotions could have been illustrated by the master hand of the creator of Mutt and Jeff?

I need not outline to you the nature of Paciolo's treatise, with which you are familiar, at least through Geijsbeek's somewhat paraphrastic translation. Any of you who have not read this will be interested in it, not merely as a piece of technical literature, but because of its quaintness of expression, its naïve attention to detail, its exuberance of piety, its flavour of mediaevalism.

It is seldom the case that a first book on a subject has so dominated its literature as was the case with Paciolo's *De Computis et Scripturis*. It is nearly true to say that for a hundred years the texts appearing in England, France, Germany, Italy, and the low countries were "at the best revisions of Paciolo, at the worst servile transcriptions without even the courtesy of referring to the original author." But further than that many little matters of bookkeeping technique were followed for at least four centuries, merely because they were inculcated by

Paciolo, persisting like buttons on our coat sleeves, long after their significance had disappeared. I need not mention these to you, but may I refer to a peculiar instance relating rather to a matter of general form?

Whether it was because of his churchly connections or because it conformed to the customs of his day, Paciolo's book is replete with gems of moral and religious advice. I know not how it may be in the higher branches, such as sociology or Americanization—but in the elementary textbooks, such as algebra or chemistry, we do not today find the thread of the discourse interrupted by bits of proverbial philosophy or moral exhortation. But in bookkeeping this has continued down until today. I might cite instances from many of the high school texts used today, from practically all used so lately as ten years ago. But let me take a single extreme example. Soule's book is still in vogue in this country. At the foot of nearly every one of his 749 pages, he has a line quite in keeping with Paciolo. The statement in the earlier writer, " Who does nothing makes no mistakes, who makes not mistakes learns nothing," is matched by Soule's " Our greatest glory is not in never falling but in rising every time we fall." " It costs more to make a good merchant than to make a doctor of laws," is matched with " Experience is not a free school, we all pay for our tuition." But even a fifteenth-century monk cannot rise quite to the level of the twentieth-century practical American who tells us " The only amaranthine flower on earth is virtue, the only lasting treasure truth." Bookkeeping was spread throughout the world by a series of plagiarisms and imitations of Paciolo. The habit of imitation became so fixed that in bookkeeping it has persisted throughout the centuries, and even the foibles of Brother Luke are reproduced in the treatises of today.

Let those who vaunt the superior merits of other disciplines remember that this first presentation made by Paciolo was not crude and incorrect but contains the essentials of bookkeeping as we know it today, despite the fact that it was written at a time when chemistry partook of the vagaries of alchemy, biology was a weird collection of errors, and medicine had more in common with the medicine man than it has even today. It may be well to see how this discipline—I do not venture to call it science—compares in its antiquity with the more arrogant natural sciences. In neither case do I go back to the feeble beginnings and adumbrations of learning but compare the position of bookkeeping, as it was first formulated in print by a university professor, with the formulation of natural sciences—not by

some dim groper in far-off antiquity—but by the first vice-president of Harvard College. A comparison, thus made, is, I am sure, more than generous to the natural sciences, despite their illiberal attitude towards the social sciences with which, in general, they admit of no kinship.

Charles Morton, who, like Paciolo, was at once distinguished teacher and cleric, was brought to Harvard from England almost two hundred years after Paciolo had formulated bookkeeping. If not professor, he was at least made vice-president, and his work on science was used as a textbook in the college.[2]

But he explained the problem of the migration of birds by saying that each autumn they flew to the moon, 200,000 miles distant, a two months' journey, and in his textbook, earthquakes are explained as follows: " They come from choking up of wind below, fermenting, bursting out, causing trembling and strokes." Or dropping into verse

> " In subterranean caverns winds do frolic
> When Mother Earth is troubled with the colic."

How marked a contrast to the teachings of the geologist at the University of California. It is told that when he appeared in court as an expert witness, the opposing lawyer foolishly attempting to ridicule his pretension of knowledge, said: " And do you pretend to know what is going on in the bowels of the earth? " To this the geologist replied: " I do not know that the earth has any bowels."

Only two hundred years ago science—in the leading American college—was a futile and ludicrous display of ignorance. More than four hundred years ago, in the very first book published on the subject, bookkeeping was outlined in a form which still prevails around the entire world. Cannot bookkeeping claim an honourable and ancient lineage? Is it indeed an upstart as compared with geology, and chemistry, and landscape gardening, and social psychology, and business English, and olericulture, and otorhinolaryngology, and other cherished subjects of the university curriculum? Founded, like San Francisco, by a follower of St. Francis of Assisi, cradled in mathematics with algebra as a twin, established under the aegis of a great university—surely this is an origin sufficiently academic to give respectability to this our " houn' dog." Perhaps I should adopt the language appropriate to the kennel and speak of book-keeping as having been sired four hundred years ago by a monk,

[2] Authority for the following statements is found in Meriwether, *Our Continental Curriculum*, pp. 188 *et seq.*

and today dammed by thousands of university students, and yet, despite certain questions which the frivolous might raise to a celibate paternity and the extremely puzzling biological enigma of such a multiple maternity, bookkeeping is thoroughly respectable.

But many a house founded by a great man has degenerated and the descendants have been of quite inferior clay. Has the later entourage of bookkeeping been made up of a fair number of respectable persons?

The second book on bookkeeping was also written by a man of distinction, Grammateus or Schreiber. He, like Paciolo, combined algebra and bookkeeping, and his book, dated 1518, was the first work published in Germany dealing with either of these subjects. On the authority of Cantor, he stands, as a mathematician, unquestionably in the front rank of his time.

Almost immediately following Grammateus was Jerome Cardan, that picturesque scapegrace and brilliant scholar, astrologer, physician, scientist, mathematician, professor of medicine first at Pavia, later at Bologna. He, too, wrote a book combining algebra and bookkeeping. This work, says Richard Garnett, marks an era in the history of mathematics, being the first in which the principle of cubic equations was fully explained. Everett says it is one of the most valuable contributions to the literature of algebra. As a physician he was so eminent that he was called to Scotland, no mean journey in those days, to attend an archbishop; he was famous enough as an astrologer to visit the court of Edward VI to cast the king's nativity. But his chief claim to distinction is his general scientific attitude, so far in advance of his times. Says Garnett: "Alike intellectually and morally, Cardan is one of the most interesting personages connected with the revival of science in Europe. He possessed the true scientific spirit in perfection. As a mathematician he effected most important advances, and to complete the catalog of his accomplishments he is no contemptible poet." And to add picturesqueness to his career he became involved in difficulties, was addicted to gaming, imprisoned for debt, banished from Milan, was later deposed from his professorship, imprisoned, released, prohibited from further teaching, but spent his latter years in Rome as a pensioner of the Pope.

Out of the first six writers three are thus seen to be men of eminent distinction—in fields other than that of bookkeeping, as judged by persons who are not themselves particularly interested in bookkeeping. Surely the early days—if not the unknown