

## Accounting Machinery of Today

THE ECONOMIC development of business organization during the last fifty years can be attributed primarily to three basic influences: (1) improvements in transportation facilities, (2) improvements in communication facilities, and (3) improvements in production machinery and methods. The increase in the size of the average business unit, together with the necessity for speed, accuracy, legibility and economy in handling the accounting records, has made mandatory the adaptation to the accounting office of the improvements in machinery and production methods necessary to enable the office to keep pace with the factory.

The practicing certified public accountant, as the independent accounting advisor to his client, continues to find himself in the position of advising or specifically prescribing as to the office machinery to be used and the related methods of handling and controlling the office operations. His status as "independent" is desirable because of the fact that the salesmen and representatives of the machine manufacturers cannot possibly be considered as disinterested advisors and at times are not sufficiently experienced to insure the fact that they recommend the most efficient machine for the job concerned.

For the guidance of the profession, an attempt has been made herein to set forth certain general fundamental principles governing the selection and installation of accounting machinery. The treatment must of necessity be general, inasmuch as the subject matter is as broad as the field of business and cannot be reduced to any precise formula.

The selection or elimination of accounting machinery must be based on an intelligent understanding of the various classes of machines available and of their relative advantages and disadvantages, coupled with a comprehensive knowledge of the nature of the transactions to be recorded and of the related organization and personnel. There is a great variety of machinery available, most of which is good. It is a generally admitted fact, however, that for any specific accounting application, some one machine or type of machine will usually have decided advantages over another.

The two basic machines which are considered standard equipment in any office are the typewriter and the adding machine. Bookkeeping machines are, for the most part, adaptations or combinations of one or both of these basic machines, with various special features added. The punched-card machines use the basic principles of both, combined with the electrical or mechanical sorting and tabulation of the cards on the basis of the perforations made thereon. The calculators represent a development of the adding machine principle. Continuous form-billing machines are a development of the typewriter, as are also remote control telegraphic bill and order machines. Addressing machines represent a distinct group, which is assuming more and more importance in relation to the accounting routines.

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NOTE.—Prepared by the committee on accounting machinery of the New York State Society of Certified Public Accountants.

## BOOKKEEPING MACHINES

Bookkeeping machines of the various types available have certain distinctive features which may be summarized as follows:

- I. Keyboards
  - a. Fully visible (81 keys)
  - b. Ten-key
  - c. Typewriter
  - d. Combination—fully visible (81 keys) and typewriter
  - e. Combination—ten key and/or calculator mechanism with typewriter
  
- II. Carriage Tabulation
  - a. Manual
  - b. Key
  - c. Automatic
  
- III. Accumulation
  - a. Registers—without automatic printing of totals
  - b. Registers—with automatic printing of totals
  
- IV. Writing Surface and Feed
  - a. Cylindrical
    1. Back feed
    2. Front feed
  - b. Flat
  
- V. Visibility
  - a. None
  - b. Partial
  - c. Total
  
- VI. Automatic repetition of postings or totals
  
- VII. Proof of pick-up

The distinctive features summarized above warrant explanation as to the mechanical factors involved and also as to their relative advantages and disadvantages.

## *Keyboards*

The fully visible keyboard consists of rows of keys numbered one to nine from bottom to top and arranged in columns side by side up to the desired capacity. Colors are used to punctuate the columns into cents, hundreds, thousands, etc. Each key has a definite value and ciphers are printed without a key stroke. No figures register in the machine until the motor bar is depressed, therefore corrections may be made in any digit at any time before the motor bar is depressed by depressing another key in that digit, thus restoring the key previously depressed, or by clearing the keyboard completely by depressing the "error" key. Speed of operation is acquired on this keyboard by visualizing the figures in such a manner that the hand works from the bottom to the top of the keyboard regardless of digit, using four fingers for the keys. While the motor is turning over, the next figures can be depressed.

The ten-key keyboard consists of keys numbered one to nine plus a zero key, arranged in a small space in such manner that they can be operated by a rhythmic touch method with the fingers of one hand. The figures are recorded by depressing the keys in sequence, reading the figures from left to right. The zero key must be actuated to record ciphers. Corrections can be made before depressing the motor bar by depressing the "error" key and resetting the complete figure.

The typewriter keyboard consists of keys numbered one to nine plus a zero key, arranged at the top or bottom of a standard typewriter keyboard. The figures are recorded by depressing the keys in sequence, reading the figures from left to right. The zero key must be actuated to record ciphers, and the space key for spaces in figures. Each figure prints as the key is depressed and corrections can be made only by subtracting out the erroneous and putting in the correct figures, either erasing the wrong figures and "non-printing" their reversal or spreading the entire operation on the record. In some cases the registers are actuated digit by digit as the keys are depressed. In other cases the register mechanism is actuated electrically as the last figure is written. In these last cases, corrections can be made prior to depressing the last figure by using the error key to clear the transaction and replacing the correct figures. Recently, certain of these typewriter keyboard machines have been equipped with the electric keyboard, which feature speeds up the operation and lessens the fatigue of the operator.

The combination of the fully visible (81 keys) keyboard with a typewriter keyboard is desirable when the operation requires a typewriter keyboard for descriptive matter, and when the features of the fully visible adding machine keyboard seem to offer advantages in recording the figures involved.

The same principle holds true in the case of the combination of the ten-key keyboard with the typewriter. The additional inclusion of the calculator mechanism makes it possible to make extensions on invoices and to calculate cash and trade discounts in the course of the machine operation. This feature may be advantageous in certain cases, as an alternative to having the calculations performed on the posting media in a separate operation before the actual posting operation.

Each of the above keyboards may have certain advantages on certain classes of work with certain classes of personnel. The one self-evident fact is that, when the descriptive data required cannot be coded into a small number of symbols, it will be necessary to have a typewriter keyboard or combination. If descriptions can be coded briefly and a majority of the figures are in even amounts, the 81-key keyboard may be desirable from the standpoint of eliminating the actuation of zero keys.

### *Carriage Tabulation*

Carriage tabulation consists of the movement of the carriage, chute or other device in such manner as to allocate the figures being posted to a certain column and totalizer. In the case of the typewriter keyboard machines, this tabulation is usually key operated, with decimal selection. For example, having finished the date, a blank tabulator key is depressed to jump the carriage to the point where the description starts; next, to place an amount of \$1,285.16 in the debit column, the operator depresses the 1,000-digit tabulator key to bring the carriage to the proper point to start the figure, repeating for the other columns to the right. The mechanism is usually set to return automatically to the starting point as soon as the end of the line is reached. The adding machine and combination keyboard machines have automatic tabulation for the most part, the carriage moving from one column to the next after the recording of the figures. The figures automatically fall in alignment on the right without decimal selection.

Some of the simpler types of adding-machine-keyboard machines have a type of carriage which normally remains in one position, but which can be moved from one column to another by hand.

One type of fully visible keyboard machine has an automatic column selection feature without carriage movement.

### *Accumulation*

Machines of the typewriter keyboard type are usually equipped with registers, so arranged as to accumulate separately the amounts typed in the respective columns. An additional crossfooting register provides for the accumulation of net balances on individual accounts as follows:

Old balance (debit) + posting (debit) – posting (credit) = new balance (debit).

On these machines there is no automatic clearance of totals, either from the crossfooting register or from the vertical totalizers. The figures must be copied from the registers.

The adding-machine-keyboard machines provide for automatic clearance of any totalizer by the depression of a clearance key. If the balances on the accounts are large and the number of postings per day per account are few in number, this automatic printing of totals may be particularly desirable.

### *Writing Surface and Feed*

Back feed refers to the conventional typewriter feeding on a cylindrical platen of the ledger sheets or other material on which the postings are to be made. Front feed refers to a feature used on the same type of cylindrical platen, which permits the insertion of material at the front of the platen. This feature is very helpful on certain types of collation of forms, particularly when a large proof sheet is kept in the machine and one or two additional forms are being collated therewith. The flat-bed feed provides a flat surface upon which the forms may be set, the posting being made by a movable typewriter head above the flat bed. This feature is desirable on certain classes of work, particularly on difficult collation of more than two forms. The flat bed also makes feasible certain features of transverse and lateral continuous carbon paper, which may be very helpful and economical.

### *Visibility*

Some machines provide for complete visibility as to the recording operation of the machine. Some provide a partial visibility and some provide none. Complete visibility is usually desirable, but its lack may be offset by other advantages. It is not as essential on the fully visible keyboard machine as on the other types.

### *Automatic Repetition of Postings or Totals*

Automatic repetition of postings or totals is possible on certain classes of machines and may be very desirable on certain machine applications. Such a feature makes possible the posting of a ledger and statement, each an original copy, in one operation, the machine automatically repeating on the second posting the complete operation of the first. In other cases it may be desirable to repeat only the total cleared from the crossfooting totalizer.

### *Proof of Pick-Up*

There are various mechanics for providing the accuracy of old balances picked up and the resultant accuracy of new balances. The most positive proof is, of course, a trial balance of the accounts operated under the control concerned. If the trial balance does not agree with the control and the daily postings have been proved against independent totals, a recheck of the pick-ups should reveal the error. In the case of a control involving a small number of accounts which are regularly active, the trial balance is probably the easiest method. However, in the case of a control involving a large number of accounts which are irregularly active, some form of daily proof on the accuracy of pick-ups is desirable. The so-called "line proof" has been evolved with variations to meet this requirement. One method of line proof is as follows:

<i>Col. 1</i>	<i>Col. 2</i>	<i>Col. 3</i>	<i>Col. 4</i>	<i>Col. 5</i>
Old balance pick-up (debit)	+ posting (debit)	= new balance (debit)	- balance pick-up (debit)	= posting (debit)

The old balance is picked up a second time from the original source, subtracted from the new balance, and the resultant "posting (debit)" accumulated and proved against a predetermined total. Unless the old balances picked up are the same in both cases and the posting is correct, the last column will not prove in total with the predetermined total of postings. In other cases, the old balances are picked up twice as above and the totals of columns 1, 2 and 4 accumulated, column 5 being dropped. The totals of columns 1 and 4 are proved against each other and the total of column 2 proved against a predetermined total of postings. These proofs as to pick-ups are based upon the assumption that an operator will not make the same mistake twice, if she has to go back to the same original figure both times. It is not 100 per cent positive control.

The particular requirements of an individual machine application will usually indicate certain of the above-enumerated features which will be advantageous.

The basic factors which should be considered in weighing the relative advantages of any bookkeeping machine are:

- a. Training necessary to operate the machine.
- b. Number of postings per day on the job concerned.
- c. Flexibility from the standpoint of application to other possible jobs.
- d. Proof of accuracy.
- e. Audit and control features.

In many cases, particularly in the small office, it is very desirable that one bookkeeping machine be used for more than one class of work. In order to make this possible, it will be necessary to use a type of machine having the various features required by all phases of the work and also the flexibility necessary to change over quickly from one operation to another.

Certain businesses require special audit and control features. A good example of such a requirement is the so-called "cashier posting routine," under which the cashiers post the ledgers, as cash is taken in or disbursed, with certification of the transaction to the customer and a complete record of all machine transactions on an audit tape locked in the machine and available only to the audit staff.

#### PUNCHED CARD MACHINES

Punched card machines are very efficient where the volume of transactions is heavy and the information contained on the cards must be reclassified and recorded more than twice. Almost any accounting operation in which the descriptive data can be coded may be handled efficiently on these machines. The basic rental cost of the equipment, however, makes it uneconomical for the handling of a small volume of transactions. The cost of the rental, the cards, and the punching and verifying of the cards may render such equipment uneconomical even with a heavy volume, when the cards are classified and tabulated only once or twice. Sorting and tabulating equipment will ordinarily function at the rate of about 400 and 100 to 150 cards per minute, respectively. The time required to handle the material concerned should be determined in advance to make certain that the necessary operations can be handled within the time available.

The punched-card method has one outstanding advantage over all others, in that once the cards are punched correctly, the sorting and tabulating is automatic and therefore not subject to errors in distribution, transpositions, etc., other than errors in machine accuracy, which are infrequent and are usually signaled by the machine, if, as and when made.

#### CALCULATING MACHINES

Each of the various calculating machines available has certain distinctive features which may affect their relative efficiency on a certain class of work. An analysis of these features, as related to a given application, is relatively simple and is not covered herein.

#### ADDRESSING MACHINES

Addressing machines are becoming more and more useful and more closely related to the accounting requirements of the office in many organizations, particularly under the requirements

of the social security acts. The number of machines available is limited and the problem of judging relative efficiency and economy is comparatively simple.

#### SELECTION OF MACHINE EQUIPMENT

The problem of determining the desirability of one type of bookkeeping or punched-card machine as compared with another, or as compared with pen-and-ink methods, is a real problem and should be solved by following a logical and intelligent procedure.

First, the accountant must make up his mind that no one type or make of machine is uniformly the best for all work; second, he must have or acquire a thorough understanding of the numerous machines and the special features of each; third, he must make a comprehensive study and analysis of the existing organization and routines of the particular business involved; and fourth, he must proceed on the basic theory that no machine, no matter how well designed and constructed, can be efficient unless it is fitted into a coördinated organization with a smooth flow of material in standardized prescribed form to and from each operation.

The economies of machine equipment in general are based upon the possibilities of handling two or more normal operations in one machine operation, the factor of daily control and proof of accuracy with the resulting elimination of rechecking a volume of work at the end of the month to prove accuracy, the elimination of peak-load periods through the steady cycle of work made possible under machine methods and the improvement in functional organization induced by proper organization for machine methods.

A review of the existing situation should reveal the following:

1. The volume of each class of transaction and the cost of handling.
2. The adequacy of the results obtained as to information supplied, and the accuracy and promptness with which available.
3. The adequacy of the methods of internal control in effect.
4. The possibilities of eliminating duplication of reports and operations.
5. The possibilities of effecting combinations of operations under machine routines.

These five points appear relatively simple, but an analysis of their scope will reveal the fact that they will require a careful review of the entire operations of all departments of the business, a tabulation of all personnel, the compensation, duties and accomplishment of each, a review of all accounting routines and a careful analysis of the adequacy of existing reports to the management.

The effect of the installation of adequate machine methods to replace pen-and-ink routines is illustrated by one reported case in which the work previously handled by 12 clerks and one supervisor, with considerable overtime work, was handled by five bookkeeping machines, with an operator for each, one control clerk and one supervisor, without overtime work. Seven people, taken from the existing group, with adequate machine equipment turned out a much more prompt, complete, accurate and neat result without the necessity for overtime, with a considerable capacity for expansion and with a resultant saving in cost calculated as follows:

Hand methods:	
Twelve clerks—total salary cost per annum .....	\$15,600.00
One supervisor—total salary cost per annum .....	<u>2,400.00</u>
	<u>\$18,000.00</u>
Machine methods:	
Five machine operators—total salary cost per annum .....	\$ 6,500.00
One control clerk—total salary cost per annum. ....	1,500.00
One supervisor—total salary cost per annum .....	2,400.00
	<u>                    </u>
Total salary cost .....	\$10,400.00
Machine cost per year:	
5 machines at \$1,400.00 each, spread over five year	
life—per annum cost.....	1,400.00
	<u>                    </u>
Total .....	\$11,800.00
	<u>                    </u>
Net Saving per annum.....	\$ 6,200.00
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The effect of employing the most suitable machines is illustrated by a reported case of an injudicious installation where four bookkeeping machines were used, representing an investment of \$5,000. As a result of a proper machine application, with some rearrangement of material and a combination of operations, one machine of a slightly different type was used to turn out the same result. The new machine cost \$1,600. Both types of machines were good, but one was improperly applied.

#### CONCLUSION

In the beginning, bookkeeping machines were used solely for accounts-receivable ledgers. They have now developed to a point where they are used for every phase of accounting activity, for accounts-receivable-ledger and statement, savings-institution ledger and pass book, hotel-guest accounts with daily departmental check, accounts payable with remittance statements and analysis of charges, check writing with disbursement register as a by-product, inventory control, commission accounts, sales analysis, etc.

Any machine installation or accounting change must justify itself either by improving the results obtained or by cutting the cost of the accounting office. In changing from pen-and-ink methods in an office employing more than four people on the actual accounting work, it will usually be possible to do both, while a careful analysis of any existing machine operations will very frequently reveal possibilities for improvements and economy. The experience of the certified public accountant in the various organizations of his clients will indicate the fact that a



majority of the business organizations of today are still very much behind the times in respect to the adoption of efficient and economical machine methods and accounting routines.