A STUDY OF SELECTED TABULATING MACHINE PROCEDURES IN THE CHAIN SUPERMARKET FIELD

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY

Stephen A. Wasser

1956

A STUDY OF SELECTED TABULATING MACHINE PROCEDURES IN THE CHAIN SUPERMARKET FIELD

By

Stephen A. Wasser

AN ABSTRACT

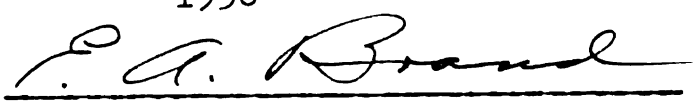
Submitted to the College of Business and Public Service
of Michigan State University of Agriculture and
Applied Science in partial fulfillment of the
requirements for the degree of

MASTER OF ARTS

Department of General Business

Curriculum in Food Distribution

1956

Approved 

AN ABSTRACT

The recent growth of the chain supermarket field has led to a vast increase in the demand for vital operating statistics and merchandise and cost control data by chain management. The demands of government have also increased the need for financial data of various types.

The field of office mechanization has shown great advances in recent years, evidenced by punched card equipment and electronic data processing machinery. Mechanical means are now available to perform many of the paperwork tasks which previously required manual effort.

This thesis attempts to portray the needs of chain management for data, and, by example and detailed description, the means by which mechanization in the office can provide the required information.

The author has drawn on his personal knowledge and experience, acquired through employment in the supermarket field as well as the knowledge and experience of fifteen men affiliated with chain supermarket organizations and representatives of the two major tabulating machine manufacturers in the preparation of the thesis. Through ten personal interviews, literature, and actual working experience, data was gathered to provide as accurate a portrayal as possible of the advantages and limitations of tabulating equipment in the chain supermarket field.

Inventory control, merchandise billing, warehouse ordering, payroll and personnel, accounts payable and related bookkeeping, are some of the areas discussed. In each instance, it is the aim of the writer to portray the needs of the industry, combined with the ability of the machines to provide the necessary data. In most instances, detailed operating procedures are explained, in order to exhibit more clearly the ability of the mechanical equipment to perform the control, listing, and calculating functions demanded by management.

The machinery involved in the various processes is explained in sufficient detail to indicate the type of job which the machines can perform. Detailed operating statistics and engineering specifics of the equipment are not included, because of the author's limited knowledge and the fact that this type of data is not needed in order to comprehend the functioning ability of the machines.

Chapter VII deals with the effects of integrated data processing on office routine. The integrated system, which combines the various mechanical phases of office procedure into a unified office system, may often result in the reduction of duplication of manual effort. Examples of integrated data processing in the chain supermarket field are included, and they are related to the descriptions of mechanical bookkeeping.

"The Food Distribution Program at Michigan State University is under the sponsorship of the National Association of Food Chains."

A STUDY OF SELECTED TABULATING MACHINE PROCEDURES IN THE CHAIN SUPERMARKET FIELD

By

Stephen A. Wasser

A THESIS

Submitted to the College of Business and Public Service
of Michigan State University of Agriculture and
Applied Science in partial fulfillment of the
requirements for the degree of

MASTER OF ARTS

Department of General Business

Curriculum in Food Distribution

1956

ACKNOWLEDGMENTS

To fully enumerate those individuals who were of aid and assistance to the writer in the preparation of this thesis would be impossible. However, there are a few such individuals without whose assistance this thesis would never have reached fruition, and who therefore deserve special mention.

Dr. E. A. Brand, Director of the Food Distribution Curriculum, whose guidance and assistance the writer will always appreciate.

Dr. William Lazer, whose advice aided immeasurably in the final preparation of the thesis, and who painstakingly worked with the author in preparing the final manuscript.

The author's professors and fellow students in the Food Distribution Curriculum, for their words of wisdom and advice.

Mr. A. W. Lishawa and Mr. James Kimling of International Business Machines Corporation, and Mr. George Campbell and Mr. Sidney Kogan of the Remington Rand Division, Sperry Rand Corporation, who gave of their time and knowledge to assist the author in his understanding of the various machine systems.

Mr. Merwin Grosberg and Mr. Joseph Gentile of ACF Wrigley, Inc., who were most generous in allowing the author

to study the tabulating systems used by Wrigley's Stores, and who made several helpful suggestions.

The author's parents and fiancee, whose continual encouragement was a tower of strength upon which he leaned on numerous occasions during the preparation of the thesis.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Tabulating equipment is not new.

> The Jacquard Loom, invented in 1728 and representing the first advance towards modern mechanical weaving, was operated by a series of holes in a card. Punched cards have been accepted over the last two hundred years in engineering circles as the best method of activating machines according to any complicated but predetermined set-up.[1]

The American public was first introduced to punched cards in the early 1930's, as the following indicates.

> The story is told of two farmers who met at the teller's window in their Ohio bank. It was in the early 1930's--the era of N.R.A. and A.A.A.--farmers being paid by the Federal government for not raising certain crops and animals. Each had in his hand an A.A.A. punched card check. Said one to the other--'Si, what do you reckon these holes are for in this check?' Said Si--'I dunno, but I put mine in my pianola last night and it played 'Happy Days Are Here Again'.[2]

Perhaps Si was stretching the point a bit, although a similarity exists between the early punched cards and the paper tape used on the pianola. "Happy Days Are Here Again," however, may well describe the feeling of many a businessman when he is first introduced to the field of punched cards

---

[1]J. Sandford Smith, Punched Card Accounting and the Professional Accountant (London: The British Tabulating Machine Company, n.d.), p. 10.

[2]J. F. Benjamin, "And so. . . . A Business was Born," The Punched Card Annual, Volume 4 (Detroit: The Punched Card Publishing Company, 1955), p. 186.

and informed of the functions that these cards, and the machinery which accompanies them, can perform for his business.

The first installation of punched card equipment in the chain supermarket field dates back to 1924. International Business Machines Corporation installed equipment for the Piggly Wiggly Valley Company in Louisville, Kentucky, which later became the Louisville Branch of the Kroger Company. In 1928, two installations were made in Chicago--one for the National Tea Company, and the other for what is now the Chicago Branch of the Kroger Company. Inventory and buying control, billing and sales analysis were the primary accounting operations applied to the machines.[3]

Over thirty years have passed since the first chain supermarket punched card system was installed. Since that time, a great many other supermarket chains have installed punched card equipment. Though the equipment has changed drastically in the past thirty years, one important factor should be noted, since it is significant to the remaining chapters of this thesis. In a recent study less than fifty per cent of those supermarket chains using punched card equipment were using it for more functions than were performed by the first system installed in 1924, even though present-day equipment is capable of performing many more functions.[4]

---

[3]Letter from A. W. Lishawa, Manager, Chain and Wholesale Department, International Business Machines Corporation, New York, July 9, 1956.

[4]Stephen A. Wasser, Accounting and Office Procedures--A Survey and Analysis in the Chain Supermarket Field (Schenectady, New York: Gershon Brothers, 1955), p. 54.

The Problem

The chain supermarket industry has grown to a volume of fifteen billion dollars of annual sales from its meager beginning in the early 1930's.[5] With this rapid growth many problems and difficulties have been encountered. The industry as a whole operated on less than a one per cent ratio of net profit after taxes to net sales in the year 1955.[6] When operating margins are so narrow, a delay in obtaining data on operating statistics may be disasterous. Moreover, recent mergers in the chain supermarket field are creating larger and more complex organizations, which necessitate current and adequate information on business operations.

The purpose of this thesis is to describe the methods and procedures by which tabulating equipment may be used to provide chain supermarket management with as much of the operating data it requires as is possible, within the limitations of the ability of the equipment and due consideration to cost. For purposes of this thesis, tabulating equipment will be defined as machinery which uses punched cards as its "input" with either punched cards or printed materials as its "output."

---

[5] A. C. Nielsen Company, The Nielsen Report to Retail Food Stores (Chicago: A. C. Nielsen Company, 1955), p. 6.

[6] News item in Supermarket News, February 6, 1956.

Methodology and Scope

The discussion of the problem necessitates the understanding of the needs and desires of chain supermarket management for specific information and statistics, as well as an understanding of tabulating equipment. Controllers and office managers of nine supermarket chains have expressed, through correspondence with the writer, their opinions of the need for operating statistics and other chain operating data. To obtain further opinions on this subject, as well as a better insight into chain problems, considerable time was spent working with the accounting staffs, tabulating departments, and other executives of two supermarket chains. Sales representatives of the two major tabulating machine manufacturers were most helpful in explaining the various uses and limitations of their equipment during several personal interviews.[7] Manufacturer's literature also provided a great deal of information about the various machines. These sources furnished a clear picture of the chain needs and the machine functions.

A building block system is used in explaining the uses of the various equipment described. The simplest procedure for each task which the machine performs will be described first. These descriptions will include the steps which must be followed, the equipment which is involved, and

---

[7] See Appendix for list.

the type and extent of resulting reports or other data. To this base will be added adaptations of the procedures which may be employed, either with the modification of the system or with the addition of more equipment. More advanced procedures, using more versatile and more expensive equipment, will also be discussed. The same basic procedure will be used in discussing each area of machine activity.

The use of this approach should enable the reader to clearly visualize the basic functions which may be performed with each type of equipment in the various areas of office work. Though it is possible to discuss the same material by dividing it into three major areas, i.e., gathering the data, compiling it, and finally using it, it is felt that the procedure followed eliminates the need to combine two or three machine uses into one discussion. A clear explanation of each individual use should present a much better picture of the procedure in question.

Limitations of time and knowledge of the equipment prohibit the discussion of all possible uses of tabulating equipment. The areas covered, however, should provide an adequate introduction to the use of mechanical methods in chain supermarket office procedures.

There are two primary manufacturers of tabulating equipment in the United States today, namely the Remington Rand Division of the Sperry Rand Corporation, and the International Business Machines Corporation, which is the larger. Both of these firms have installed a large amount of their

equipment in the offices of chain supermarket firms. International Business Machines claims that "there are upwards of 500 chain and wholesale grocers dealing with supermarkets currently utilizing IBM punched card equipment."[8] Remington Rand has supplied this writer with a list of over one hundred of their customers in the chain and wholesale grocery field.

There are, in addition, two other firms which are active in the field. One is the Samas Punched Card Division of the Underwood Corporation, and the other is the McBee Division of the Royal McBee Corporation. Neither of the latter two firms has made much of an impact upon the chain supermarket field. Because these companies do not manufacture a full complement of machines, and therefore can not perform all the functions which either an IBM or a Remington Rand installation can perform, neither the Samas nor the McBee system will be discussed in detail.

The equipment manufactured by IBM and Remington Rand is not interchangeable. A punched card installation will contain equipment manufactured by one firm, or the other, but will seldom contain both types. It is possible, through the use of a card convertor, to change cards from the type used by one manufacturer to the type used by the other; however, the same card can not be used in the machines manufactured by both companies.

---

[8]Letter from A. W. Lishawa, Manager, Chain and Wholesale Department, International Business Machines Corporation, New York, December 13, 1955.

Although there are a great many mechanical differences between the two brands of equipment, it does not seem necessary or advantageous to deal with them here. With few exceptions, both companies manufacture machines which perform the same functions. Basic punched card machinery is manufactured to perform one or more of the following functions:

1. It punches holes in cards.

2. It senses the holes and uses the data contained therein to:

   A. Place the cards in a pre-determined sequence

   B. Compute required data

   C. Print the data on the same card

   D. Print the data on another card or form.

In the chapters which follow, no distinction will be made between IBM and Remington Rand equipment where both companies manufacture similar machines. Where a change of procedure would be necessary because of the inability of one manufacturer's equipment to perform the same functions as the equipment produced by the other manufacturer, the differences will be explained. If necessary, two different procedures which will obtain the same or similar results will be outlined.

CHAPTER II

BILLING AND INVENTORY CONTROL: TUB FILE SYSTEM

One of the functions which is generally performed by a chain of supermarkets for its stores is that of storing or warehousing merchandise and shipping it to each store as needed. In order to perform this function with speed, ease, and accuracy, a system must be established whereby the warehouse inventory is controlled, and store orders are processed quickly and correctly. The use of punched card equipment simplifies these tasks considerably. Results of a recent study indicate that of the group of chain supermarkets surveyed, two-thirds of all chain organizations with eleven stores or more use some form of punched card equipment. In all cases where the firm warehouses merchandise, punched card equipment is used for inventory control and merchandise billing.[9]

In establishing any system of inventory control, several component parts must be considered. These elements consist of the beginning inventory as of a particular starting point, additions to the inventory brought about by merchandise purchases, deductions from the inventory caused by shipping merchandise out of the warehouse, and miscellaneous additions or deductions in the inventory resulting from price

---

[9]Wasser, op. cit., p. 53.

changes, overages, shortages, shrinkage, and other factors. When the ending inventory is taken, it should coincide with the ending perpetual inventory reported by the tabulating department.

With the use of tabulating equipment, a constant reference is available for cost and retail prices, since this information is contained in the cards. It is customary to use both cost and retail prices in computing inventory evaluation and price data for shipping invoices to stores.

There are two basic systems which are in common use today for controlling merchandise inventories and billing merchandise to retail stores. They are discussed in the chronological order of their origination.

The first system of billing and inventory control established for use with tabulating equipment is commonly called the unit control or "tub file" system. The system derives its name from the fact that a punched card exists for each case or "billing unit" of merchandise located in the warehouse, and these cards are filed, generally in commodity number sequence, in a bin or "tub." A billing unit is generally one case, though it may be more or less. The tub file is thus an exact replica of the warehouse.

The tub file system of merchandise billing and inventory control parallels the operations of the warehouse in almost every detail. When merchandise arrives in the warehouse, cards representing each case are placed in the tub files. These cards adequately describe the merchandise, as

the following paragraphs explain. When merchandise is removed from the warehouse, whether for return to the supplier, shipment to retail outlets, or for any other reason, the appropriate cards are removed from the tubs. The cards go through other stages of processing after they leave the tub files, and these developments are discussed and described in the following paragraphs.

In order to understand the operations which follow, it is necessary to understand the machines which are used to perform the various functions. Described below are the four basic machines which are needed in the tub file system of inventory control and merchandise billing. (As each new item of equipment is added to the process, in order to change the operation of a system or to expand the area covered by a system, that machine will be described and explained.)

The first of the machines is the Key Punch. It is the media for introducing all original data to the machines, through the use of holes punched into cards. The operation of the key punch is similar to that of a typewriter. However, instead of printing the data it punches the data into cards, using an alphabetical and numerical code understood by all the machines in the tabulating installation.

The second unit is the Reproducing Punch. This machine produces one or more cards identical to any punched card which it is given as a master card. If some data on the master card is not desired in the subsequent cards, this unwanted data may be omitted by appropriate wiring of the reproducing punch.

The next machine is the Interpreter. This unit "reads" the holes in a card and prints the data in regular alphabetical and numerical symbols on the card itself. With this machine, appropriate wiring will also omit the printing of any data which is not to be interpreted. The interpreter prints only on the original card, and has no capacity to punch holes in the card.

The fourth unit is the Tabulator, also referred to as the Accounting Machine or Printer. This machine is the "workhorse" of any tabulating installation. It is the only basic machine which "reads" holes in cards and prints this information on something other than the card itself. The tabulator accumulates both negative and positive numerical information, thus adding and subtracting, but not multiplying directly. It prints sub-totals and totals as desired. It lists all cards and then prints totals, or it prints totals only, without listing, depending upon the instructions given it through wiring.

The tub file system requires that one card be maintained for each case of merchandise located in the warehouse. Though the data in the cards may vary from firm to firm, depending upon individual needs, the following information is customarily maintained:[10]

---

[10]International Business Machines Corporation, "Warehousing Control for the Grocery Industry, Form #22-3760-0," (New York: International Business Machines Corporation), p. 5.

1. Item commodity number. This is the means of identifying the item to the machinery, and is the commonly used identification.

2. Item name. This is for reference only, and though it is used for printing invoices and the like, it is not generally used by the machinery for other purposes.

3. Item description. This generally consists of the size of the individual unit (can, jar, or package) or its weight, and the number of units to a shipping case. This is also merely an identification item, and is used by the machines to segregate two similar items differing only in one or more of these elements, where the commodity number is the same.

4. Cost per case. This figure is used in accumulating cost totals, as well as for identification.

5. Unit retail. This figure is used for informing the retail outlet of the correct selling price. It is not used for calculating purposes.

6. Retail per case. This is the figure used for accumulating the retail value of an invoice.

7. Weight per case. This figure is included primarily for the benefit of the warehouse and/or shipping department, in allocating delivery equipment. Each invoice generally carries a total weight figure for this purpose.

When merchandise is placed in the warehouse, a receiving report or similar document is sent to the tabulating department detailing the information mentioned above, and the

number of cases received. From this information a master card is punched on the key punch. The master card is processed through the reproducing punch with the appropriate number of blank cards. Some reproducers are adapted to count out the required number of blank cards automatically, if this data is punched into the master card. Where this type of reproducer is used, the quantity needed is generally punched into the master card along with the other descriptive data.

If desired, the cards which are processed by the reproducer and are now referred to as "detail cards" may be processed through the interpreter, which prints the data on the cards. The detail cards are now ready to be placed in the tub file. They are preceeded in the tub by a "header card" which is a card of the same width as the standard punched cards, but stands higher and is made of a stiffer substance. This header card contains only the commodity number of the cards which follow it, and is used as a guide for the individuals who pull the cards from the tubs.

There are several modifications which can be made in the tub files, to facilitate working with them. One of the first is that of end-printing the detail cards with the commodity number and consecutive numbers. The reproducing punch is adapted to add these additional numbers to the card. Cards are generally pulled from back to front. The first detail card in the tub has the designation of "1," the second card, "2," etc. When looking at the last card under a particular commodity number designation, the number on it indicates the number of cards for that item which are in the tub.

If a new shipment arrives while there are still cards in the tub from the previous shipment, the new cards may be numbered in two ways. First, they may be numbered starting with the next highest number from the last card in the tub, and are thus integrated with the old cards as one continuous group. This system is seldom used. The second method, which is the most common, is to number the new shipment starting with the number "1." These cards are placed in the front of the tub, preceeding the old cards. A "high card," which is a blank card of a stiffer substance than the punched cards and stands higher in the tubs, is placed between the last card of the new shipment and the number 1 card of the old shipment. To obtain an inventory figure when more than one shipment is in the tubs, the numbers on the last card of each shipment are added together.

Another simple modification is the use of a "minimum signal card." This card is used to advise the buyers that an item has reached the level of stock which has been pre-determined as a reorder point. The card, which is prepared by the buying department, is also higher than the punched cards. It contains the commodity number, description, and the reorder quantity. If a particular item has a minimum stock level of ten cases, the minimum signal card is placed in the tubs following the detail card with the number "10" end-printed on it. When the number 10 card is pulled, the minimum signal card is also pulled. The date is noted upon it, and it is sent to the buying department.

A further modification is the use of an "out-of-stock" card which is placed in front of the number 1 card for each item. It is pulled when the number 1 card is pulled, and is also sent to the buying department, indicating that there is none of the item left in the warehouse. This card is sometimes a punched-card of a different color than the detail cards. At the end of the day, the tabulating department may list these cards on the tabulator, giving the buyers a list of all items which were removed from stock that day.

Another possibility is the use of "out" cards. These cards are punched cards containing the same data as the detail cards, but are also of a different color. They are placed in the tub in front of the out-of-stock card. Their use is explained more fully in the discussion of merchandise billing.

Additions to the tub file for purposes other than receipts of merchandise from vendors, such as goods returned by stores, are handled in the same manner as previously described.

Merchandise is removed from the warehouse for two primary purposes. The less important of the two, and the simplest to handle, is for returns to vendors. The cards are removed from the tub files in the sequence previously described, i.e., from back to front. The cards are then listed on the tabulator, and a copy of this list is sent to the vendor with a request for credit. It must be remembered that the tub files should at all times reflect the physical inventory within the warehouse.

The procedure used for processing store merchandise orders is somewhat more complex, and thus requires a more complete explanation. The first step in any billing operation is the preparation of the order at the store. This may be handled in several ways. The most common system, however, employs a pre-printed order book which contains the commodity numbers and item names and descriptions for all merchandise carried in the warehouse. There is space next to each item to insert the quantity ordered. This blank space is filled in at the store.

The next step is that of transmitting the order to the tabulating department of the office. In most cases, this is done by physically transferring the order book, either by messenger, company truck, or the mail. The telephone is sometimes used for transmitting the order.

Once the order is received in the tabulating department, it must be assembled. This refers to the order in card form, rather than in actual merchandise. Where orders are telephoned to the tabulating department, the person answering the phone either writes down the order in an order book similar to the one used at the store, or, with the use of a long cable on the telephone headset, moves around the tub files pulling the cards as the store dictates the item number and quantity. More common, however, is the system where the order book is delivered to the tabulating department. The processing is the same in both cases; a girl moves around the tub files, pulling the cards which are called for

by the order book. The tub files are generally arranged in the same sequence as is the order book.

Once the order is assembled in card form, the invoice is then printed on the tabulator. This machine lists totals for each item. By means of a cycling device built into the machine, the tabulator senses the commodity number, but does not print until it has sensed all cards with the same number. During this sensing process, the tabulator accumulates the number of cases, the retail price per case, the cost per case, and the total weight. When the cycling for any commodity number is completed, it prints the commodity number, name, description, and the accumulated data. It follows the same pattern for all subsequent commodity numbers. At the conclusion of the invoice, after all cards have been accumulated and printed, the machine draws invoice totals for the number of cases, the total retail value, the total cost value, and the total weight. These are printed at the bottom of the invoice.

When the cards are placed in the tabulator, a "header card" designating the store name and/or number and perhaps the store address is inserted prior to the detail cards. This designation is printed at the top of the invoice, and serves as a means of identification for the invoice.

Billing invoices of this type are generally printed in multiple copies. One copy serves as the basis for charging the merchandise to the store; one copy is used by the warehouse as the basis for selecting the merchandise to

be shipped; and one copy goes with the order to the store to be used as a price guide and a means for checking in the order as it is unloaded from the truck.

This is the means by which the tub file system of merchandise billing is handled. It is referred to as a pre-billing operation, since the bill (or invoice) is prepared prior to the shipment of the merchandise.

Reference has been made to the use of out-of-stock cards in the billing program. Where these cards are used, one card is pulled for each case of merchandise which the tabulating department is unable to bill, because it has no detail cards and, presumably, because the warehouse has no stock of the particular item. These cards are accumulated separately from the detail cards, and are run on the tabulator in the same manner as is the invoice. A copy of the resulting list, generally referred to as an "out invoice," is sent to the warehouse with the regular invoice. If the merchandise is in stock, either because of an error or because a new shipment has been received but has not yet been processed by the tabulating department, the warehouse ships the merchandise as per the out invoice, noting on the out invoice the merchandise and quantity that it ships. The out invoice is then returned to the tabulating department where an invoice is prepared and the cards are pulled from the tub files. (It is assumed that by this time the new cards are in the tubs.) This phase of the billing program is referred to as post-billing, since the invoice is prepared after the merchandise is shipped.

The out cards used during any one day are generally kept. At the end of the billing day, these cards are sorted by commodity number. This process involves the use of a Sorter. This is a machine which senses the holes in a particular column and, as the cards feed through, drops them in separate "pockets" of the machine according to the number or letter sensed. It is in this manner that cards are placed in alphabetical or numerical sequence.

Once the out cards are sorted by commodity number, they are listed on the tabulator. This list, containing the descriptive data of all merchandise which was out of stock and the number of cases which were ordered but not shipped, is sent to the buying department to indicate the magnitude of ordered but unshipped merchandise.

It has previously been noted that the only means by which an inventory of a particular item can be ascertained at a given moment is to look at the cards in the tub file. This system is suitable for spot-checking a few commodities, but is far from convenient when a total book inventory is desired. Using only the equipment that has previously been mentioned, there is just one mechanical method of computing a book inventory. It involves passing all detail cards through the tabulator so that the machine can accumulate the totals and print an itemized list.

Another type of data that the buying department generally desires is the amount of movement in each item stocked. With the equipment previously mentioned, this report can be

prepared for management, but it involves a long and tedious process. It requires saving of all detail cards which have been billed and, periodically, sorting them by commodity number. The cards, in commodity number sequence, are processed through the tabulator which accumulates the number of cases and the cost and retail value of each item which was shipped. If management wants this data further divided to show item movement by store, the detail cards can be gang-punched with the store number after each order is processed. The reproducing punch is used for this process, with the master card containing only store number and date. By sorting the cards for each store by commodity number for a given period, and listing them on the tabulator, the data can be obtained. For total movement the figures are either totalled by hand (or with an office desk machine) or all the cards are sorted again by commodity number and processed through the tabulator. Needless to say, the number of cards involved in this process is so great that the performance of these functions is financially prohibitive.

With the introduction of one additional machine, the card volume required to produce these additional reports can be reduced considerably. The machine is called a Summary Punch and is attached to the tabulator. It punches a card, if desired, for each line which the tabulator prints. Thus one card is created where a line of billing may represent five or ten cards. The card consumption is increased as this is done, however the volume of cards needed to perform

successive functions is decreased. It is sometimes advisable to process the detail cards for each store through the tabulator and summary punch on a monthly, rather than a daily or weekly basis. For a quarterly report, only four cards are needed for each item rather than thirteen or more. The summary punch adds greater flexibility to any tabulating installation, because of its ability to decrease card volume. It has a few additional uses in a tub file billing operation.

The method of producing a periodic inventory list without the use of the summary punch would be so time-consuming as to make it impractical. If the summary punch is being used to compute and prepare movement reports, it is relatively simple to adapt its use to periodic inventory reports as well. Assuming that a movement report for a quarter has been prepared, and that summary cards were punched for the report, it is now possible to prepare an inventory report with relatively little effort. To use this system, it is necessary to prepare a card for each merchandise shipment received. These are "receipt" cards and are filed after being prepared. A beginning inventory card is needed for each item, but this is prepared manually only once. The beginning inventory card for each item, plus the receipt cards, followed by the summary cards from the movement report (indicating them with punches for negative rather than positive quantities) are fed through the tabulator. The machine adds the beginning inventory to the purchases, and subtracts the movement. It prints the balance, which is the ending

inventory. With the summary punch in operation, cards are punched with the new balance. These are the beginning inventory cards for the following quarter. It might be noted that even with the use of the summary punch, these two procedures, i.e., periodic inventory and movement reports, are still quite cumbersome, and thus many firms do not prepare them. With additional equipment, these reports are prepared as by-products of the billing operation. This is discussed more fully in the following chapter.

Price changes sometimes effect data in the cards. If a cost price changes, only the new cards added to the tub reflect the new cost. The master card also reflects it, but the old cards in the tub do not. If a retail price changes, however, the master card is changed, as are all cards in the tub file, (regardless of when the cards were placed there). This means considerable card waste in case of price changes.

The preceeding discussion has dealt with the machines necessary to perform the various billing and inventory control functions using the tub file system. The various cards needed were also mentioned, including the punched cards as well as header cards, high divider cards, minimum signal cards, etc. No mention has yet been made of the tub files themselves, which are used to hold the cards. As changes have been made with other equipment, the manufacturers of tub files have also attempted to keep pace with the progress being made by other phases of the industry.

The early tub files produced for commercial purposes were made of oak. One of the first users was a candy manufacturer. The machine company representative handling the account cautioned the manufacturer that the tub was very special and that there would be no future demand for them as a standard product. It was not too many years before inventory control in the chain grocery field brought the tub file usage much to the fore.[11]

Steel replaced wood in punched card files when the general office furniture industry largely made this change. At the time that one of the large office machinery companies first made metal tub files for a grocery installation, they learned, through experience, that tabulating cards are much heavier than they anticipated. The customer's tabulating department spent many hours setting up the tubs with cards and guides. On returning the next morning to start operations, much to their amazement the files had sunk to knee height from counter height--the steel legs bowed from the uncalculated weight.[12]

> More people have more ideas regarding the tub files than any other product. Tubs have been 'circular-ized,' 'half-moon-ized,' 'motor-ized,' 'compressed-air-ized,' 'compartment-ized,' 'tilt-ized,' and still, with rare exception, the conventional rectangular tub proves to be the most efficient in all-around application and use. That isn't to say it will remain so.[13]

---

[11] Benjamin, op. cit., p. 187.

[12] Ibid.

[13] Ibid.

Though the writer quoted above does not feel that any of the mechanized tub files are too effective, there are some firms that have been extremely satisfied with their use.[14] The principal underlying mechanized tub files is that of bringing as many cards within arm's reach of the person operating the tub file as is possible, without requiring her to move around the tub. Newer innovations are bound to appear in this field in the future.

---

[14]National American Wholesale Grocers' Association, Inc., "Memo #118-A," (New York: National American Wholesale Grocers' Association, Inc.), July 9, 1955.

CHAPTER III

BILLING AND INVENTORY CONTROL: BATCH BILLING SYSTEMS

Because of the need for more information on merchandising movement, and more up-to-date and complete inventory data, the tub file system of inventory control and billing was found to be lacking. As previously noted, this system can not produce movement and inventory reports quickly, frequently, or with a minimum amount of machine time. Another system, "Batch Billing," was derived which solves many of the problems caused by the tub file system. In so doing, however, it creates new problems and new difficulties with which the user must cope. It is because of these new problems that batch billing is not universally accepted. The name of the system is derived from the fact that with its use, orders are processed in batches or groups, rather than as single units, as is the case with the tub file system.

With the batch billing system, new equipment is needed. This system is intended for use with some type of electric or electronic calculating machine. However, a modification of the system can be developed which, though not as acceptable as true batch billing, does alleviate the need for a calculating punch. The modified system is described in detail later in this chapter, since it is the true batch billing system which has received the wider acceptance.

Some additional equipment is needed for a batch billing operation, in addition to the machines previously mentioned. The basic unit needed is some type of calculating punch. The simplest of these machines performs all types of simple mathematics, including addition, subtraction, multiplication, and division. It has the ability to store or remember data, in varying quantities, and for varying lengths of time. The simplest of the machines has no permanent storage, but it holds data until the conclusion of any particular function, at which time it either punches the data into a card, or disposes of the data by just "forgetting" it. The simplest calculating punch manufactured by IBM is their 602. Progressively larger machines are the 602A, the 604 (which is the unit most commonly used in a batch billing operation), the 607, which is the smallest of the truly electronic machines, the 650, and several other even larger units. The smallest calculating punch manufactured by Remington Rand is the UNIVAC 60, which is comparable to IBM's 650. Remington Rand does make a multiplying punch, but it does not perform the other calculating functions needed for a batch billing operation.

Another unit needed is the Collator. Though there are several types of collators available, principally the machine has the ability to intersperse groups of punched cards in a manner predetermined by the wiring of the machine. It also segregates cards, and compares them. The machine checks card sequence or similarity of data in cards, and it can perform a

checking function and a segregating or interspersing function simultaneously. The collator can also intersperse blank cards into a group of punched cards in a pre-determined manner. The other equipment needed, including sorters, key punches, tabulators, reproducing punches, and summary punches is discussed in Chapter I.

One of the predominant features of the batch billing system is the absence of tub files. Instead of a master card for each item and a detail card for each case of merchandise, as is required with the tub file system, the batch billing system requires only the master card to be maintained. The master card is similar to that used in the tub file system, with a few additional items added. The card contains the usual master-card information, such as commodity number, name, description, unit retail, case retail, case cost, and case weight. In addition, however, it contains the current inventory and its movement to date, in terms of cases and dollars.

With the batch billing system store orders are written at the store in a similar manner to the tub file system. They are transmitted to the tabulating department in any of the ways previously mentioned. It is only after they are received at the tabulating department that they are handled differently.

When merchandise orders from the store arrive at the tabulating department one card is punched for each item ordered, regardless of how many cases of an item are on the order. The card contains the store number, the item commodity

number, and the number of cases. The store number is not manually key punched by the operator for each card. This data is punched only once for each store--at the beginning of the order--and is automatically punched into each succeeding card for that particular store. An entire batch or group of orders is key punched in this fashion before the next step in the billing process takes place.

The number of batches processed in a working day varies from firm to firm. Some chains prefer to process only one batch per day, while others select two or more. Generally six orders are considered to be a minimum number for a batch. As the number of batches increases, so does the amount of machine time involved in the entire billing day. All orders must be processed through the key punch operation before they can proceed to the next process. Where only one batch is processed daily, all orders must necessarily be received by the tabulating department before the key punching can be completed. Where several batches are processed daily, key punching of orders takes place several times during the day, so that all orders need not be received before the first key punching operation is completed.

When merchandise arrives at the warehouse, one card is punched for each item placed in stock. With the absence of the tub files no detail cards are reproduced. Only the date received, the commodity number, cost per case, and number of cases is punched. Once the store orders for a particular batch are key punched the cards are then prepared for the next phase of the process.

This phase involves the sorting of all punched cards for store orders and all cards punched with merchandise receipts, by commodity number. For the sake of simplification, these cards will be called billing cards and purchase cards, respectively. Once sorted, the resulting deck of cards is placed in one feeding mechanism of the collator, and the complete deck of master cards in the other feeder. The machine is set to intersperse the two decks of cards, using commodity number as the basis. Master cards for which no billing or purchase cards are present are segregated into one pocket of the machine, billing and/or purchase cards for which no master card is present are segregated into another. The merged cards are placed in a third pocket. There should be no detail cards (either purchase or billing) for which there is no master card. If any do appear, there is an error which must be checked. Master cards for which no detail cards appear are left out of the following operations, since no movement or other activity occurred in these items.

The merged deck of detail and master cards is again placed in the collator. The other feeder (also referred to as a magazine) contains blank cards. The machine is set to intersperse one blank card after each group of cards with the same commodity number. This blank card may be referred to as a trailer card, since it follows all the punched cards with a particular commodity number.

The completed deck of cards, which contains master cards, purchase cards, and billing cards in the order

indicated, and a blank card for each commodity number, is then placed in the calculating punch. The machine performs several functions while the cards are passing through. The functions are enumerated below:

1. It senses and remembers all data contained in the master card.

2. It punches all descriptive data from the master card into the purchase cards.

3. It adds the number of cases purchased to the beginning inventory, retaining this amount for future use.

4. It adds the dollar cost value of all new purchases to the dollar cost value contained in the master card, and, by dividing this amount by the number of cases, arrives at a new average cost per case.

5. It punches this new average cost per case, as well as all descriptive data into the billing cards. As each billing card passes through the machine, it deducts the quantity called for from the inventory which it has calculated. If there is insufficient inventory to meet all billing requirements, the machine punches an identifying punch into all billing cards for which there is insufficient inventory.

6. As the trailer card passes through, the machine punches into it the various descriptive data, the new average cost per case, and the resulting ending inventory figure, both in number of cases and total dollar amount. It also punches a new movement to date figure in number of cases and

dollar value. This data is calculated by adding the movement from this batch to the movement to date contained in the master card. If there is no master card or no trailer card for any group of cards, the machine will stop.

Once the cards pass through the calculating punch, they are sorted again. This time they are sorted on the column which contains a key number designating the type of card. Thus all billing cards fall into one pocket of the sorter, all purchase cards into another, all master cards into a third, and all trailer cards into a fourth pocket. The master cards are then filed and the trailer card becomes the new master card. The purchase cards are also filed, while the billing cards are ready for the remainder of the billing operation.

All billing cards are processed through the sorter to segregate those cards for which there is insufficient stock of merchandise on hand. The remainder of the cards are sorted by store number. With a header card placed at the beginning of the group of cards for each store, the invoices are run on the tabulator. The no-stock cards may also be sorted by store number, and, with appropriate header cards, listed on the tabulator. The resulting list is an out invoice, which is sent to the warehouse along with the normal billing invoice.

If an inventory and/or stock movement list is desired, the new master cards are merely listed on the tabulator. All movement and inventory data is already contained within them,

and was calculated as a by-product of a normal billing procedure. The only additional procedure is the preparation of the lists on the tabulator, which requires only one card for each item. Since a tabulator generally lists at a speed of one hundred cards per minute, not much time is needed to prepare this list.

Mention was previously made of a modified batch billing system. This system is used primarily by users of Remington Rand machinery who do not have a UNIVAC 60 or one of the larger computers. In this modified system, the basic unit of machinery is a Collating-Reproducing-Punch. This machine combines the function of the collator with that of a punching unit. Since the system does not use a calculating punch, some other method is needed to calculate extensions and compute new balances. There are two methods. The first, which involves no new machinery, limits the ordering unit to predetermined quantities, and employs the use of a master extended deck of cards for all items carried. This master extended deck contains the commodity number, name, and description of the items, plus the cost and retail extensions for predetermined quantities. An installation of this type with which the writer is familiar uses two master extended decks. One deck contains extensions for one, two, and three cases of merchandise. The other carries extensions for five, ten, and fifteen cases. Billing cards must be punched in these quantities.[15]

---

[15]Central Markets, Inc., Schenectady, New York.

Once the billing cards are punched, they are sorted by commodity number, and then re-sorted to segregate the billing cards which are used with each of the two master extended decks. The cards are then placed in the collating-reproducing-punch, which punches the descriptive data and the appropriate cost and retail extensions from the master extended decks into the billing cards. The cards are then interspersed with the master inventory card and the purchase cards, which are individually punched. The entire deck is processed through the tabulator, which adds the purchases to the old inventory, and deducts the quantities and amounts on the billing cards, thus computing a new balance. The summary punch puts the totals into a blank card which becomes the new inventory card. By comparing the old inventory card and the purchase cards with the new inventory card, a movement report may be prepared on the tabulator. A new average cost per case is not used with this system. Price changes, either cost or retail, are made in the master extended decks manually.

The second system employs a multiplying punch. This machine multiplies number of cases times case price, and punches the extension into the card. The remainder of the system is the same as has just been described.

There are several advantages to the use of the batch billing system. The system prepares a greater number of inventory and merchandise movement reports with less time and effort than the tub file system requires. In addition, the

batch billing system usually reduces card cost, since only one card is used for billing regardless of the number of cases ordered. This saving is further expanded when card wastage due to price changes is considered. With batch billing, only one master card need be remade, rather than the entire tub inventory of cards.

There are a few disadvantages to the batch billing system. Because of the batching of orders, it is necessary to receive orders in the tabulating department several hours before they are processed by the warehouse. This "lead time" varies with the individual company and the number of batches processed daily, but is always as great or greater than that required by the tub file system. Since the batch billing system involves machine operation almost exclusively, it necessitates better trained personnel than does the tub file system. Inexperienced help, or girls borrowed from other office functions, can pull cards from a tub file if the need arises, but substitute employees are not capable of operating a key punch.

In places where a floating slot system of warehousing is in use, i.e., where merchandise may be simultaneously located in more than one warehouse location, or where warehouse location of merchandise is changed frequently, the batch billing system is not practical. More than one inventory card is needed, and machine selection of this type is quite complex.

Where a great number of small orders are processed, or where rush orders are predominant or frequent, batch billing becomes very cumbersome. Inventory data can not be kept up to date if a batch is interrupted in order to process an individual order. In addition, the time required for a small order is almost as great as the time needed to process an entire batch of large orders, since all master inventory cards must be included in the process regardless of the size of the batch.

Several factors must be given careful consideration before determining whether tub file or batch billing is better suited to a particular installation. The size of the orders, the frequency of rush orders, the amount of lead time needed with each process, must all be weighed carefully. Where the warehouse movement is sufficient to warrant the additional machine expense, the trend in recent years seems to point to batch billing for chain supermarkets. Wholesale firms, because of their large numbers of small orders, and the frequency of rush orders, have not been as willing as the chains to accept batch billing. Some chains which have this problem have also decided to maintain the tub file system.

Recent Innovations

The Batch Billing procedures previously described are effective in providing chain store management with required statistics and tabulations. It has been found, however, that the manual work involved in key punching the detail billing

cards is time-consuming, and, because of the human element involved, is susceptible to human error. The need arose, therefore, for a system which combines the advantages of batch billing with the elimination of the chance for human error. In recent months both of the major punch card equipment producers have developed systems which attempt to solve the problems. The two systems are quite different, and thus require separate explanations.

International Business Machines Corporation has developed a billing system which it calls the "Card Order Plan." The difference between this system and a normal batch billing operation is solely in the creation of the detail billing cards.

The creation of the punched detail cards for the Card Order Plan originates at the store, rather than in the tabulating department, through the medium of mark-sensing. In this particular application, the order form is modified from the usual pre-printed order catalog of merchandise. The items are still listed in the usual manner, but no blank spaces are needed in which to indicate quantity ordered. Blank spaces may be provided, but these are used only as a store reference for quantity ordered, and do not serve as the order itself. A mark sense card, corresponding to the printed catalog, serves as the actual order.

This system, as developed by IBM with the assistance of the Penn Fruit Company, Philadelphia, Pennsylvania,[16]

[16] Interview with A. W. Lishawa, December 30, 1955.

provides for twenty-five order lines on each side of the order sheet. The order card, which is aligned with the sheet at its right, has corresponding line numbers. Both the order sheet and the order card are printed on both sides, thus allowing a maximum of fifty commodities to be listed on each sheet and card. The order sheets and cards are affixed in a binder which permits the person writing the order to flip the pages and the cards, always assuring alignment.

The order card has columns provided for quantities of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, and 40 cases. The column or columns desired are blacked in with a special electrographic pencil. For quantities of ten cases or less, only one column need be marked. For quantities over ten, two, three, or four marks may be needed. It is possible to order a maximum of seventy-nine cases of any particular commodity. Once the order has been written at the store, the cards are removed from the binding, and sent to the office for further processing.

The cards which are provided each store are end-printed and punched with the store number and page number, to aid in identification. Line numbers are printed on cards and order pages alike.

Some specific machinery is needed to process the order cards. Two units other than those previously described are required. One of these is a Mark Sensing Reproducer. This machine has the same characteristics as the reproducer described in the preceeding chapter, but has the added ability

to sense the markings on the card, and punch a hole in all columns so marked. The second machine, referred to as a Card Order Convertor, is, in reality, two key punches linked together through cables. When not being used in this process, the two key punches may be operated manually, and independently of each other. When used in the card order process, one machine is referred to as the Order Card Reader, while the other is called the Detail Card Punch. The former unit reads page number, line number, and quantity, while the latter machine punches the necessary data into a detail billing card.

When the order cards are received in the tabulating department, they are first processed through the mark sensing reproducer. It is necessary to pass the cards through the reproducer twice, since they are marked on both sides. The reproducer punches all columns which are mark sensed.

Once punched in this manner, the cards are then routed to the card order convertor. They are placed in the order card reader, while blank cards are placed in the detail card punch. As the first order card is fed through the machine, the store and page number is reproduced into the first detail card. The detail card remains in the machine, while the order card is scanned until a punched item is sensed. The corresponding line number for this item is then punched into the card, followed by the quantity. It should be noted that the page number, combined with the line number, is the five digit commodity number which is used in further processing.

As the order card reader continues to scan the order card, each subsequent quantity punch causes the creation of a new detail card.

When a detail card has been created for each item marked on the order card, the next order card is fed into the reader automatically, and the above procedure is repeated. It is not necessary to pass each order card through the convertor twice, as it was through the reproducer. The machine senses and punches all columns on one pass.

Once the detail cards are created for a batch of store orders, they are sorted by commodity number, and processed in the same manner as if the cards had been key punched manually. This sytem is used only with a batch billing system, as it is not easily adaptable, or desirable, with a tub file system.

The system which Remington Rand has devised is, in the opinion of this writer, equal to IBM's Card Order Plan. The two systems have many of the same attributes. To date, however, the Remington Rand system has not been used in a grocery operation. What follows, therefore, is a description of the plan as the author feels it would be operated in a chain supermarket billing system.

The system involves the use of a hand punch at the store level, rather than the mark sensing which is used with the IBM system. The punch used is similar in appearance to a small hand paper punch. The notable difference is the pin or rod which is attached to the upper part of the punch,

and which pierces the center of the area covered by the punch itself.

As is the case with the card order plan, this system also involves the creation of cards at the store. There are, however, several differences. The card in this instance is a standard ninety column Remington Rand card, which has a maximum capacity of six punches per column, or a total of 540 punches. If two columns are used for the store identification number, and two columns for a prefix number or card number, the capacity is reduced to 516 maximum punches. With this system, it is possible to use each of the remaining punching positions (516) for one commodity, with a stipulated quantity of one case. Thus for an order book containing 3,000 items, a total of six cards is needed, where the IBM system requires sixty cards. The card is pre-punched with the store number and the card number, and the remaining punching positions are factory punched with pinholes the size of the pin on the hand punch. The card is printed with the commodity numbers over each of the corresponding pinholes. A printed order book or similar list would be needed as a reference to determine which commodities carry which numbers.

To order one case of any particular commodity, the person writing the order merely punches the appropriate column with his hand punch. The pin inserted into the pinhole assures correct punching alignment. For quantities other than one case, there are several alternatives possible. However, it should be noted that between 65% and 85% of all

items are ordered in single case quantities, and 95% to 99% of all commodities are ordered in quantities of ten cases or less.[17]

Quantities of more than one case can be ordered by writing up these items in an order book or on an order form provided by the office. It is also possible to have a separate group of cards prepared with the commodity numbers of items that are frequently ordered in larger quantities, and allow the store to punch the desired quantity into the card. If this latter system is used, a maximum of eighty-five items can be carried on each of these multiple-case cards, since each commodity requires at least a full column. It would be necessary to make two punches in the card for each instance where an even number of cases were ordered. This is required, since the Remington Rand numerical code calls for six punching positions per column; the 0, 1, 3, 5, 7, and 9. To punch an even quantity requires that the odd number below the desired quantity plus the nine position to be punched. Thus a two would be a one and a nine, a four would be a three and a nine, etc.

If orders for quantities in excess of ten cases are common, it might be necessary to allow two columns for each commodity, reducing the item capacity to approximately forty-three per card. Another modification is to have additional cards printed which carry constant quantities of other than one. Thus one series of cards with particular commodity numbers printed thereon is for quantities of two. A third

[17] International Business Machines Corp., "Card Order Plan, Form #23-6698" (New York: IBM, 1955).

series of cards might carry a quantity of ten, etc. On these cards, the full capacity of over 500 positions could be used. One card for each quantity is sufficient in most cases.

Once the cards are punched and the order written for those items which are not punched into cards, the entire order is sent to the tabulating department. The punched cards are placed in a Card-to-Tape Punch. This machine has as its normal function the sensing of holes in a card, and the punching of the sensed data in a five-channel tape. In this operation, the card-to-tape punch senses the store number and the card number and retains that data. For each item punched, the machine punches the store number, card number, column number, and the punched position into the tape. The machine is fitted with a column analyzer which allows it to sense the column number, even though it is unpunched. Once the tape is prepared, it is placed in a Tape-to-Card Punch, which senses the holes in the tape, and punches individual detail cards for each commodity, adding the quantity of one (or other quantity, if the machine is so wired) to the data which the tape has supplied. These are the detail cards which are used in the following procedures. Where the multiple case cards are used, the card-to-tape and tape-to-card procedure is followed again, setting the latter machine to insert the proper quantity.

As has previously been noted, both the card order plan and the spot-punch plan are used only with batch billing. Any organization which uses a batch billing system, either

of the conventional type or of one of the types mentioned in this section, must believe in the importance of speeding up overall company operations. This may require that the stores perform additional work, or submit material such as orders farther in advance that would be otherwise necessary. Any firm which feels that it must cater to every wish of its stores cannot effectively operate under any type of batch billing system. The tub file system was derived from a need to provide quick service to the stores. With batch billing, this is not possible. The modified systems described above require the stores to carry a larger share of the burden of the billing operation. It takes a store as long and perhaps longer to write an order with this system as with the conventional system. The process of billing, however, is greatly speeded up once the order is received at the tabulating department. The philosophy of the chain supermarket operator must indeed be taken into consideration before a system of billing and inventory control can be instituted. Each system herein described has its limitations and its place in the chain supermarket field. The goals and policies of the individual firm combined with the attributes of the several systems will help to determine which system is best suited to any particular organization.

CHAPTER IV

TABULATING EQUIPMENT AS AN AID TO THE PURCHASING DEPARTMENT

In the grocery store of yester-year, the function of buying dry groceries was a relatively simple task. It was, in many instances, a one-man function. Stock control was considered to be an ivory tower idea, conceived in the dreams of those who knew little about the grocery business. The functioning of a warehouse for most grocery stores was a relatively simple task--since the store itself was the only warehouse in use. The buying function was merely a matter of placing orders with one or more wholesalers. Little follow-up was required. This grocery store concept has changed considerably, and as a result the buying function and the necessary controls which accompany it have also changed a great deal.

Today, a buyer for a chain of supermarkets no longer operates a one-man department. He must work in close coordination with all other operating departments, including the advertising department, the warehouse, and where tabulating equipment is in use, the tabulating department. Each must be fully aware of what the other is doing. Because of the vast amount of capital invested in inventories, the importance of stock control is recognized and accepted, and the need for information of this type is still growing.

This chapter deals with one phase of the buying operation, and its necessary correlation with two other departments; namely, the warehouse and the tabulating department. It should be pointed out that the procedures discussed herein may not fit all companies in all cases, but the concepts and ideas are sufficiently basic so that they may be easily adapted to fit individual circumstances.

The following discussion is presented primarily as background material on the ordering, checking, and stock control principles and practices as they are commonly found in the chain supermarket industry today. The author has drawn liberally from one source with which he is quite familiar.[18]

At the buyer level, there are two basic sources of merchandise and methods of ordering this merchandise.

1. Manufacturer's representatives, either food brokers or company salesmen, who call on the buyers periodically.

2. Orders placed directly with manufacturers or food brokers, either by telephone or mail.

In the case of brokers or salesmen calling on the buyer, most chains have found it advisable to establish some type of schedule, whereby these individuals call on the buyers at regular intervals. In some cases this may be weekly, but bi-weekly or tri-weekly calls seem to be more

---

[18]Central Markets, Inc., Schenectady, New York.

prevalent today.[19] Mail and phone orders, of course, are placed as needed. Here, too, however, a general schedule may exist.

The systems by which a buyer determines merchandise needs vary considerably. Where a punch card system of inventory control is used, there are a few common methods employed, some of which have previously been discussed in greater detail. The three which find the greatest use are:

1. A "minimum signal" card which the tabulating department sends to the buyer when inventory of any item reaches a pre-determined level.

2. A periodic inventory list of all items which the tabulating department prepares for the buyers.

3. A buyer's request for inventory data on all items purchased from a particular vendor.

In many cases, two or all three of these systems are combined. The use of all three, of course, leads to a much more complete presentation of inventory position to the purchasing department.

Regardless of which systems are used, most buyers keep their own stock cards, as a ready reference for current inventory, past purchases, and merchandise on order. These cards, listing all items purchased from any one source, commonly contain the item description, commodity number, price

---

[19]Joseph McDermott, Partner, Hotaling-McDermott Company, Food Brokers, Albany, New York.

data, inventory information posted from the reports submitted by the tabulating department, notations of all orders and merchandise receipts, as well as historical data on item movement and whatever other information the buyer may feel is pertinent.

An example may be of use in illustrating the operation of a buyer's ordering system. Several assumptions are needed, in order to clarify the operation, and these follow:

1. The buyer maintains stock cards for all vendors.

2. He receives minimum signal cards from the tabulating department when the pre-determined recorder quantity has been reached.

3. He receives semi-weekly a complete inventory report of all items carried in the warehouse.

4. When a particular salesman is due to call, the buyer has the most current inventory data for that salesman's items posted to his stock card.

5. If the quantity on hand makes reordering questionable, the buyer may ask the tabulating department for more current inventory data.

To make this example clearer, it is assumed that on Mondays and Thursdays the tabulating department prepares inventory lists. On alternate Tuesdays, Mr. John Smith, salesman for the XYZ Company, calls on the buyer. On the previous Monday, the inventory on hand for all XYZ items is posted to the buyer's stock card. This data is obtained from the Monday inventory list. When Mr. Smith arrives, the buyer places

his order, based upon the inventory data contained within his stock card. Mr. Smith writes the order in duplicate, retaining one copy for himself, and leaving one copy for the buyer.

In the above example, neither the warehouse nor the tabulating department is informed of the fact that an order was placed with the XYZ Company. In fact, this information does not concern these two departments until the merchandise arrives, perhaps some nine days later.

When the merchandise arrives at the warehouse, someone in the receiving department generally writes up a freight slip or receiving slip, showing the merchandise commodity number, slot number (location within the warehouse), item description, and the number of cases. Any damaged merchandise is noted, so that credit may be requested. To inform the tabulating department that the XYZ shipment has arrived, and is ready to be distributed to the stores, the warehouse may call the tabulating department and dictate to someone in that department the details of the XYZ shipment. Where the warehouse and the tabulating department are in the same or adjacent buildings the freight slips may be brought immediately to the tabulating department. If the phone is used, arriving freight may be called in either continually, or just daily, depending upon the volume.

Once the tabulating department is informed of the receipt of the merchandise, it must process these receipts to bring its perpetual inventory up to date. If a tub file

billing system is used, the necessary number of detail cards are reproduced from a master card, and placed in the tubs. If a batch billing system is used, a receipt card is punched for inclusion in the next batch processed.

In reviewing the above system, it is readily seen that much time and effort has been devoted to writing details of this single shipment manually. The original order was written in the buying department by the salesman, the warehouse listed the items as the shipment was received, the tabulating department may have had to copy the data if the warehouse telephoned the information to them, and, finally, the adjustment to perpetual inventory was made. In addition to the time and effort involved several other problems may arise in a program of this type. Some examples follow.

Generally speaking, a warehouse receiving clerk is neither noted, nor hired, for his clear penmanship. In spite of this known fact, the receiving slip written by the warehouse receiving clerk must be used in several succeeding functions. It is used by the buyer to check the receipts against his original order. The accounts payable department uses it to verify the invoice for the merchandise to assure proper payment, and the tabulating department may use the receiving slip to adjust its perpetual inventory. If a warehouse employee is sloppy about his handwriting, or makes more mistakes than may normally be expected, errors and confusion may result.

It is an accepted fact that errors are more likely to occur each time that data is recopied. When the same information must be re-written, some errors must be expected.

The ordering system now commonly used in the chain supermarket field appears to be cumbersome. A more simplified system which can eliminate the time and effort wasted through recopying of data, the difficulty in interpreting handwriting, and the dealy in transmitting information from one department to another is valuable.

A new system has recently been developed by the buyer of a medium-size chain of supermarkets.[20] It overcomes many of the disadvantages of the present system, while maintaining control and speed in buying, checking, and controlling inventory.

The discussion thus far has dealt with the use of punched card equipment as an integral part of the buying and control functions. With slight modification, this equipment can aid in solving the problems which are encountered.

With either the tub file system or the batch billing system of inventory control, a master card exists containing various data regarding each item stocked by the warehouse. The buyer's stock card is also used with either system. It is a relatively simple task to assign a number to each stock card, representing one broker or one salesman. In effect, these numbers are vendor designation numbers. The master

---

[20]Harry Wasser, Director of Purchases, Central Markets, Inc., Schenectady, New York.

card for each commodity can also contain the vendor number appropriate to its source. Mechanically this creates no problem since vendor numbers can be key punched into the master card when that card is created.

If the previous illustration may be employed using the new system, its operation will be made clear.

If it is customary for the buyer to place orders for merchandise bi-weekly, the tabulating department performs one additional task every two weeks. All master cards, and a group of header cards which contain only the vendor name and number, are sorted by vendors. The cards, once sorted, are placed in the tabulator and listed on a purchase order form which is printed for that purpose. This list represents purchase orders, without quantities, for all items carried in stock by the warehouse. These forms are prepared in quadruplicate, and all four copies are sent to the buying department with the carbon paper remaining intact.

Referring to the illustration, as in the earlier case the buyer has brought his stock card up to date with the XYZ items' inventory. When the buyer places his order, however, he does not dictate quantities to the salesman. He writes the quantity ordered in the column of the pre-printed purchase order provided for that purpose. He dates the order, signs it, and gives one copy to Mr. Smith. One of the copies is placed in his file. Saving number one: Time is not wasted in writing out each item.

The buyer retains two copies of the XYZ order. One of these is sent to the warehouse, and the other to the purchasing department.

When the XYZ shipment arrives, it is checked at the warehouse. The warehouse receiving clerk goes to his purchase order file, and pulls out the XYZ order. He checks the arrival of all merchandise that arrived in good condition, or notes any damages or shortages in the space provided next to each item. Saving number two: The warehouse clerk does not write out each item, including commodity number, description, and quantity. He merely notes any exceptions to the order as printed.

To transmit notice of the receipt of the XYZ order to the tabulating department, the warehouse may make a phone call. Here again a saving is incurred. Saving number three: The warehouse does not have to dictate the details of the receiving report, and the tabulating department does not have to record details. The warehouseman merely names the company and the purchase order number, and the exceptions to the purchase order. If the warehouse is given a blank purchase order, the clerk reads the items which have been received. The tabulating department then checks the warehouse report against its copy of the original order. Additional savings result from the fact that errors are less likely to occur, since even the warehouse employee does not have to read his own handwriting in most instances.

The warehouse copy of the purchase order, after being verified with the tabulating department, is sent to the purchasing department. Saving number four: Without checking each item in detail, the buyer can readily see the exceptions to the original purchase order as written. Once he has finished with the warehouse copy of the order, the buyer transmits it to the accounts payable department, where it is kept until the invoice arrives. When the invoice arrives, Saving number five is incurred: The accounts payable clerk is not required to read the warehouse clerk's handwriting in most instances, but merely checks the printed order against the printed invoice.

This system appears to have one disadvantage. If warehouse personnel is not competent, and if the purchase order form has quantities written on it, incoming merchandise may not be accurately counted. This disadvantage can be overcome by removing the carbon paper from the warehouse copy of the order before the quantities are inserted. In this way, the warehouse receives a purchase order in blank, and the receipts are written in manually. It is still unnecessary for the warehouse clerk to write the full description of the merchandise.

The advantages of the system are that time can be saved and errors reduced by eliminating the necessity of recopying data. In addition, the copies of the purchase order received by the warehouse and the tabulating department may serve other purposes. The warehouse may use this list of

merchandise on order to assist in determining space requirements. To the tabulating department is serves as an indication that the buying department has ordered merchandise which may be out of stock or low on stock.

No additional equipment is needed to perform this function. The additional burden to the tabulating department may consist of devoting approximately one hour per week to sorting cards and tabulating purchase order forms.[21] The result is the addition of a new facilitating function to the functions already performed by the tabulating department for the buying department. If the tabulating department has the time available, and if the buying department feels that the system will reduce confusion and error the system may be instituted. The additional cost is negligible, and the results in time saved and errors reduced will in most cases offset the slight cost increase.

---

[21]Central Markets, Inc., Schenectady, New York.

CHAPTER V

PAYROLL PROCEDURES AND PERSONNEL RECORDS

One of the bookkeeping functions which is found to be quite time consuming and costly in a chain supermarket operation is payroll. Whenever a large number of employees must be paid in a relatively short amount of time, this payment process and the paperwork required by management and government involves a great deal of time and effort.

Some firms believe that employees should be paid for their week's work at the conclusion of the particular week. If this procedure is followed, the payroll may either be prepared by the store personnel, or by the office on the basis of estimates submitted by the store. An office-produced payroll which is in the hands of the store at the conclusion of the work week usually contains some inaccuracies which must be collected later. It is unlikely that every employee would work exactly the number of hours called for by his schedule. For this reason most firms that pay on Saturday for the week ending that day require their store managers to prepare the payroll. Since this does not involve office preparation of payroll data, store payment is not discussed further.

When a firm is willing to allow several days between the actual work week and the time of payment, the entire payroll procedure may be performed at the office. It is in this connection that tabulating equipment may be used effectively.

The first step in determining a payroll procedure involves the determination of the information needed and/or desired. The following data is generally desired in any payroll system, whether or not the system is mechanized through the use of tabulating equipment:

1. Employee's name
2. Employee's Social Security number
3. Employee's "clock number" or "badge number" (In some cases, the Social Security number also serves as the clock number.)
4. Employee's job classification and store number
5. Number of exemptions claimed by employee
6. Rate of pay (This may either be an hourly rate, or a weekly rate. A "standard work week" must also be established, so that overtime pay may be determined when necessary.)
7. Designation and amounts of any sundry deductions from wages in addition to Social Security and Withholding Tax deductions, such as:
   A. Union dues
   B. Hospital and medical program payments
   C. Life Insurance program payments
   D. Government bond deductions, under Payroll Savings Plan
   E. Deductions for company bonds or company stock, under employee's options to purchase

F. Miscellaneous contributions, such as Red Cross, Community Chest, etc.

G. Employee's Credit Union investment or payment deductions

There are two possible systems by which payroll data may be handled with tabulating equipment. The primary difference between the two systems is the use made of a calculating punch. As was indicated in a previous chapter, many firms which use Remington Rand equipment have found that the size of their organization does not warrant the installation of a UNIVAC 60 (the smallest of Remington Rand's electronic computers). Where this is the case, a modified system must be used to calculate the payroll data. The system is described more fully in succeeding paragraphs. The more common system, one which uses a calculating punch, either manufactured by IBM or Remington Rand, is described first.

Once the required data has been determined and obtained, a master card is key punched for each employee, containing the necessary information. This master card is maintained by the tabulating department, and is used in processing each weekly payroll.

Next, a procedure is established whereby the number of hours that each employee works during a week may be reported to the tabulating department. In some cases, a time clock is used at the store to record this data. (The card may be a standard tabulating card, pre-punched with the employee's clock number or social security number.) If this

type of card is used, the hours worked are totalled and key punched into the card by the tabulating department. If another type of card or a time sheet is employed, the number of hours as well as the employee's clock number are key punched into a tabulating card when the data reaches the tabulating department.

The payroll detail cards containing employee's clock number and number of hours worked are sorted by clock number, placing all cards in sequence. They are then placed into one feeder of the collator, with the master cards being placed into the other feeder. The collator is wired to intersperse the two decks of cards segregating those master cards for which there are no detail cards, and those details cards for which no master cards exist. A master card without a detail card indicates that an employee did not work that week. A detail card without a corresponding master card indicates that an error exists and further verification will be needed.

When the collating operation is completed, the merged deck of cards is placed in the calculating punch. This machine senses the data contained in the master card, and performs the following functions:

1. It punches the descriptive information regarding the employee into the detail card, including his name, his job classification, the store in which he works, his social security number (if this is not used as the clock number), and the number of exemptions that he claims.

2. It multiplies the number of hours times the rate contained in the master card, punching the resulting gross pay into the detail card.

3. It multiplies the gross pay times the current social security tax rate, punching the resultant amount into the detail card.

4. It multiplies the gross pay times a specific percentage used to determine the withholding tax, punching the resulting amount into the detail card.

5. It punches the miscellaneous deductions from the master card into the detail card.

6. It adds each deduction as it is punched, subtracting the total amount of all deductions from the gross pay.

7. It punches the net pay into the detail card.

8. It punches an identifying hole into the detail card if the gross pay minus all deductions is a negative figure.

When the cards are removed from the calculating punch, they are processed through the sorter, which segregates the master cards from the detail cards. The master cards are refiled, for use the following week. The detail cards are ready to be processed further.

The deck of detail cards is processed through the sorter again to place them in sequence by store groups. It is in this sequence that the employees' pay checks are written. When the sorting process is completed, the checks may then be printed.

Using a tabulating system, there are two machines which are capable of printing checks. The most common of these is the tabulator. A new machine, called a Posting Interpreter, is also capable of printing data punched into one card on another card. If punch-card checks are to be used, either machine may be used for this function. If paper checks are desired, the tabulator must be used. For other reasons, including the advantage of the summary punch when wired to the tabulator, this latter machine is generally used to print checks.

The cards are placed in the tabulator, with the summary punch operative. As previously indicated, either card checks or paper checks are used. The advantage of card checks is found in the ability to sort them at some later date, such as for purposes of bank statement reconciliation. The cost of card checks is somewhat greater that that of paper checks. The detail cards are printed on the check forms and the resultant checks contain the data which has been punched into the cards. The summary punch produces cards indicating the total of each financial element, by store, and/or department.

When the checks are printed, the tabulator is set to print totals of all financial data on a separate report form. The total produced by tabulating the summary cards should equal the total resulting from the accumulation of the data on the checks.

Several other documents may be obtained at this point. By listing the summary cards on the tabulator, a report can be printed showing the payroll expense for each store and/or department. If a cumulative total of each employee's earnings and deductions to date is desired, an additional deck of cards is required. This deck is prepared from the first week's detail cards, and is identical to them. For each successive week, the detail cards and the year-to-date cards are interspersed, either by processing them through the sorter or the collator. They are then processed through the collator with a blank card following each set of cards. The merged deck is placed in the calculating punch, which adds the current week's financial data to the year-to-date data, and punches the totals into a blank trailer card, which becomes the new year-to-date card. This process can be performed periodically, rather than every week.

Where payroll is processed through tabulating equipment without the aid of a calculating punch, the system is considerably more cumbersome, takes more time, and involves a greater number of cards. First it requires a group of cards, each of which has an hourly rate, a number of hours worked, and a number of exemptions punched into it. In the aggregate, this deck of cards must account for all combinations of hourly rates, number of hours worked, and exemptions. The master rate deck, as this is called, can be of considerable size, because of the large number of factor combinations. This deck also contains the extensions

for gross wages, social security tax, withholding tax, and net wages before other deductions, computed from combining the factors in each card.

The payroll detail cards, which have been reproduced from the payroll master cards, are sorted on exemption status, number of hours worked, and hourly rate. The master rate deck is placed in the same sequence. Both decks are processed through the collating-reproducing-punch, which punches the financial data from the corresponding master rate card into each of the detail cards. The two decks of cards are then separated, and the master rate deck is refiled for future use.

For each deduction other than social security and withholding taxes, a separate card is needed. This card contains the employee's clock number, the code designation for the deduction, and the amount of the deduction.

The master payroll card used in this system is the same as that used with the system previously described, except that it does not have the data relative to other deductions. The deduction deck just mentioned is used to account for that data.

The detail cards are sorted into store and/or department sequence. Then the deduction cards are interspersed with the detail cards, either mechanically, by sorting or collating or manually. The manual method is probably faster since the deduction cards do not contain a store designation.

Once the deduction cards are merged with the detail cards, they are placed in the tabulator with the check forms. The tabulator subtracts the other deductions from the net wages before deductions and prints all necessary data on the check form. With the summary punch operative, a card containing the net pay for each employee is obtained.

Year-to-date earnings cards are prepared by using the tabulator and summary punch to prepare new cards each week. The other documents may be prepared in the same manner used by the other system.

In addition to the speed and accuracy gained by using tabulating equipment for processing payroll, much of the extra data desired by management and required by government is created as a by-product of the normal weekly operations. When the weekly payroll procedures are performed manually, these other reports must be prepared in a separate operation.

In the preceeding paragraphs, no mention was made of changes which occur in the data contained in payroll master cards. Changes occur in employee's names, exemptions, and pay rates. These require that the corrections be made on the payroll master card and the permanent employee records maintained by the personnel department. These changes are often one source of difficulty in a payroll system.

Many firms have prepared special printed forms which are used by the stores in reporting personnel changes to the personnel department. Though the forms are generally well prepared and simple to understand, information is frequently

omitted by the person filling out the form, and confusion and inaccuracy often follow. Few firms have attempted to mechanize the reporting of changes, although mechanization may be the answer to partially solving the problem of inaccuracy and omissions in change reporting. One supermarket chain organization has just begun the preliminary work necessary to install a system of mechanized personnel and payroll change reporting.[22] The following paragraphs represent a sketch of the manner in which all changes will be reported once the new system is instituted.

The personnel department prepares two copies of a personnel record card from information obtained from each employee. These copies are punched and interpreted, so that they can be read easily. One copy of each card is maintained by the personnel department. The other copy is sent to the store in which the employee works, where it is maintained by the store manager. Each card contains the following data about the employees:

1. Social Security number
2. Date of Birth
3. Marital Status
4. Sex
5. Date Employed
6. Date Terminated (not punched until that time)
7. Date of last pay increase
8. Date of next automatic increase

[22]Wrigley's Stores, Division of ACF Wrigley, Inc., Detroit, Michigan.

9. Pay rate
10. Insurance status
11. Union status
12. Store number
13. Job code
14. Payroll status
15. Employee's name

Whenever a change occurs in any of the data listed above, it is the duty of the store manager to cross out the printed item and pencil in the corrected data below the appropriate column on the card. The card, once corrected in this manner, is sent to the personnel department. The personnel department pulls the identical card from its permanent file, and makes up two new cards with the appropriate corrections. One of the new cards is sent to the store, while the other replaces the old card in the personnel department's permanent file.

The old card which has been pulled from the personnel department's records is placed in the employee's permanent personal history folder kept by the personnel department. The old card which the store has sent in, with the pencilled corrections, is sent to the tabulating department. With this card as its source, the tabulating department can correct its master payroll card, so that the data is correct when the next pay checks are processed.

It may not seem that this system, using cards instead of printed forms, causes any change in the effectiveness of

the change-reporting system. In this system, the store manager notes only the corrections (rather than listing all the data pertaining to the employee.) It is felt that by reducing the amount of writing necessary, the written data will be presented more accurately, and the confusion and inaccuracy may thereby be reduced.

Once this system is installed, there are several other uses for the cards. Some examples follow.

1. If filed alphabetically, they serve as a locator file for all company employees.

2. If sorted, they may be used to prepare lists of employees by job class, by store, or by pay rate.

3. If maintained with an address file, they may be used to compile mailing lists of employees in any particular category.

Because of the flexibility of placing the cards in any sequence by mechanical sorting, it appears that maintaining punch card data for company personnel can improve speed and accuracy in several required operations and procedures.

CHAPTER VI

ACCOUNTS PAYABLE PROCEDURES AND RELATED BOOKKEEPING FUNCTIONS

The office of a chain supermarket firm handles a great deal of day-to-day paperwork. It has few receivables to handle, but the bulk of its payables may at times be astronomical.

There are generally invoices for two types of merchandise which are handled by the Accounts Payable department of a supermarket chain, in addition to Accounts Payable invoices for expenses. The merchandise invoices are those for goods which are delivered to the firm's warehouse, and those for goods which vendors deliver directly to the stores. It is this latter group which generlly represents the largest number of invoices, though the total dollar volume of this group will generally be less than the dollar volume of invoices for warhouse purchases.

Tabulating equipment may be adapted to handle the totalling of all invoices from a particular vendor, and the printing of the payment check. Before these procedures can be performed, however, several preliminary steps must be taken.

The first step in the Accounts Payable program is to assign code numbers to each vendor. This can be achieved by using previous invoices as a guide, and allowing sufficient

numbers for new accounts. It is advisable for each expense item to be coded according to its ultimate placement in the distribution of expenses, which is preliminary to the preparation of operating statements. Included in this number grouping are designations for type of expense, store to be charged, and department within the store. For other expenses which are not allocated to stores, similar codes for warehouse expense, trucking, administrative expense, etc., are used.

A further series of codes is needed to enable a vendor to interpret the designations printed on his check.

The following example may serve to illustrate this point further:

CODE	EXPLANATION
1	Gross amount of the invoice
2	Freight allowance
3	Discount
4	Credit memorandum
5	Damaged merchandise

The needs of any particular organization are an important determining factor in establishing the code designations needed.

As each invoice is received at the office, it is checked against a freight receipt to assure the fact that the merchandise arrived in good condition. Invoices which are left at the store by direct-delivery vendors are sent to the office after damaged merchandise or shortages are noted.

Once the correct amount of the individual invoices is determined, they are coded with each of the proper designations for vendor number, account to be charged, and adjustments. They are then sent to the tabulating department.

The tabulating department key punches one card for each invoice. These cards are segregated according to the date that each is due for payment. When the invoices in any group are to be payed, the tabulating department places the cards in the sorter, and sorts the cards into vendor number sequence. Cards for credit memos and other allowances are in each group, as well as invoice cards. Once the cards are sorted, they are placed in the collator. The other feeder of the collator contains a group of header cards which are punched with the vendor number, name, and address. The collator places the header card in front of the detail cards for each vendor.

Once the detail cards are interspersed with the header cards, they are ready to be tabulated. They are placed in the tabulator, with Accounts Payable check forms. The summary punch is turned on, so that summary cards may be obtained for each check. The summary cards are later punched with the check number, so that a check register may be printed on the tabulator. The tabulator prints the necessary additions to and subtractions from the gross amount of the total invoices. It prints the final total on the check stub, as well as on the check itself. The checks are then ready to be signed and, if desired, registered with a check-writing machine to prevent alteration.

The primary advantage of using tabulating equipment for the above procedures is not to be found in the area of time saving, but in the area of additional reports and statistical data which can be obtained through further processing.

Related Bookkeeping Functions

At the conclusion of the several stages of processing Accounts Payable invoices, there are two sets of cards which are available for further use. One set of cards is composed of the detail invoice cards--one card for each invoice or credit memorandum. The second set of cards is made up of one card for each check written to a vendor. This latter deck of cards can at any time be combined with similar decks from previous periods and sorted by vendor number. When listed on the tabulator, the resulting document provides an excellent source of information of the amount of merchandise which has been purchased from any particular vendor. This list is invaluable to the purchasing department for allocating further purchases, or requesting various types of advertising and promotional allowances on the basis of past purchases. Commonly referred to as a "vendor analysis," this list requires a great deal of time to compile unless the original data is punched into cards. It is now produced as a by-product of other procedures.

The deck of detail cards may be used for posting entries to general ledger accounts, as well as for the preparation of interim store and/or department operating statements.

At the conclusion of a particular period, a deck of cards is created which represents all changes which have occurred in each ledger account throughout the period. The deck is created by sorting the detail cards which are prepared for each entry into account number sequence. A beginning balance card for each account is interspersed into the deck by using the collator. The tabulator is then used to prepare a list of all entries to each account, and the summary punch prepares a card which can be used for two purposes. First, it serves as the beginning balance card for the following period. Secondly, it serves to prepare a trial balance for the period in question. It should be noted that the bulk of the cards needed for this process are not punched primarily for this purpose, but were previously created to perform the Accounts Payable function. The additional cards needed are, in most cases, also created as by-products of other operations. One of these is the preparation of store and/or department operating statements.

There are several items which are needed to prepare a store operating statement. Basically, these can be classified as follows:

1. Beginning inventory--This is the card punched at the conclusion of the prior period, with the physical inventory taken at that time.

2. Merchandise receipts--These are represented by the detail invoice cards for direct delivery shipments, plus the summary cards produced as a by-product of the warehouse billing operation.

3. Store expenses--These are represented by the detail invoice cards for expenses incurred at the store, plus cards punched for expenses which are pro-rated to the stores from a central account.

4. Payroll data--This is represented by cards produced as a by-product of the payroll operation.

5. Store sales--These are punched into cards from figures compiled by the bookkeeping department.

6. Ending inventory--This is punched into a card, from data obtained through a physical inventory.

Once this data has been obtained and is in card form, a store statement of "Cost of Goods Sold" is prepared by combining the beginning inventory cards, the cards for purchased merchandise, and the ending inventory cards in either the sorter or collator, and processing them on the tabulator. The summary punch produces one card for each store (or department) indicating "Cost of Goods Sold." This card, combined with the other cards indicated above, may again be combined and processed through the tabulator, and the Operating Statement will result. This report is prepared in a minimum amount of time, once the original cards have been prepared. If most cards are already available, having been used in a previous operation, or created as a by-product thereof, the preparation of store and/or department statements is a relatively simple task. Since no new equipment is necessary to perform these functions, the additional cost is negligible as long as machine time is available. The

time required to mechanically prepare these reports is substantially less than that required to prepare them manually.

CHAPTER VII

INTEGRATED DATA PROCESSING

The previous chapter pointed out some of the means by which data collected during one phase of a tabulating procedure may be used in several succeeding phases, resulting in different types of reports and tabulations. There is a great deal of data that is used in a chain supermarket office, however, that never finds its way to the tabulating department. It is used in other departments, and is never processed through tabulating equipment. Where some of this material is needed for preparing subsequent reports on tabulating machines, it is manually key punched into cards, so that it can "speak the language" of the tabulating machines.

This concept of machines speaking a language, though perhaps not accurate in the true sense of the work "speak," does have a place in the discussion of machine operations and machine techniques. The following paragraphs indicate the use of this concept.

Looking back into history momentarily, the changes that occurred in the punch card field were paralleled by changes in other office equipment. The various types of rotary calculators, electric adding machines, and bookkeeping machines which are now considered an integral part of most offices were being invented--and improved upon. The following paragraphs indicate that these machines became more important and useful -- instead of decreasing in their

usefulness -- as more modern and automatic devices made their entry into the office.

As improvements were made in office machinery, and management was able to obtain more and more statistical information about the operation of the business, the members of the management team demanded still further information--only they wanted it faster. The speed of the machines was increased, and more and more improvements were made. As time went on, however, the members of management found that they were having difficulties. They had demanded more and more data. -- and the office was supplying them with it. They had used some of it, but because of time limitations, much of it was never used. At the same time, business was prospering and growing, and management found itself with more sales volume to worry about, and more expenses to watch. In the chain supermarket field, there were more stores, more financial worries, more inventory to control, and more store personnel. As each person is added to the payroll, or each additional case of merchandise added to the warehouse or shipped from it, the volume of paperwork increases. Management, which could devote less time to studying records and reports, was finding that the office was presenting it with even more reports than before. Something had to be done. Some office efforts were being wasted, and management could not find the material it really needed.-- in the mass of all the other data.

In reality, it was found that management could no longer keep its finger in each and every segment of the business, and guide it effectively. Authority had to be delegated, and this was accomplished in many instances. Top management, however, wanted to be aware of what was transpiring. Difficulties which needed top management decisions had to be called to management's attention. What was needed, in effect, was the use of the principle of "management by exception." Top executives could establish rules and regulations by which the business was to operate, and establish the necessary budgets within which each division of the enterprise was to confine itself. As long as the operations were conducted according to the established rules and regulations, and within the tolerance areas permitted by the established budgets, top management had no reason or desire to be overly concerned as long as business conditions were rather stable. Where a department or a division failed to maintain the standards which were established top management aid was needed. Even here, however, new problems were met. How was management to be informed of a breach of regulations, or a failure to meet a standard or a budget? The reports that the machines were turning out listed only the facts--and did not segregate those areas which were outside the established routines or budgets. Management was still faced with the necessity of weeding out the wheat from the chaff. Time was not even available to perform this task effectively.

It was at this stage of the office revolution that the electronic computers or "mechanical brains" were introduced. These giant machines have the capacity to perform calculations, to remember information, to make selections on the basis of instructions, and to predict some future occurrences. Here is a tool that an overburdened management needs. Here is a machine that takes the burden off of management, by aiding in the performance of managerial functions! Here is the piece of equipment which sifts data and makes decisions according to previously presented instructions. In actuality, here is the type of equipment which is helping to bring about a new fantastic era in office mechanization.

With the introduction of the giant computers, a great deal of data becomes available to management. More important, however, is the fact that it is made available in a brief, consolidated, and useable form. The "exception" principle of management has been enhanced and aided through the genius of some very exceptional men; the men who had invented the computers. One area, however, had been almost completely overlooked. That area, mentioned above only briefly, was one of the early beginnings of office mechanization. . .the various "original data" machinery which is so common. Yes, the rotary calculator, the bookkeeping machine, the adding machine and the typewriter were still outside the automatic office. Since they are still required, it was necessary to integrate them into the system. The key word here is integration, for what resulted from further developments was the conception of Integrated Data Processing.

Until the idea of integrated data processing was developed, the conversion of data originally prepared on one of the basic machines just mentioned to one of the modern electronic or punch card machines was necessarily a manual conversion. As an example, the data from a typed invoice or order which was to be used in subsequent computations and reports, for which punch card machinery is desirable, must be manually key punched into a card in order to be used.

Another example is the use of billing machines to post data to accounts receivable or accounts payable subsidiary ledgers. It may be desirous to use punched cards to summarize various data at a later date. Again, it is necessary to manually key punch the required data into cards.

A further need for a "common denominator" or "universal language" for machines was necessary because of the differences in equipment manufactured by competing companies. The language of machines manufactured by IBM is oblong holes punched in cards, while Remington Rand's machine language is round holes. Since the two types of machinery "speak different languages" they can not be used together. It is sometimes necessary to use both types of machinery, or both types of cards, especially where one firm prepares cards which are later used by another firm.

In order to solve this problem of machine language, the five-channel punched paper tape was universally agreed upon by equipment manufacturers as the "common language" of the machines. Most manufacturers of business machines are

now producing equipment which will convert data from the language of its own machines, be it oblong holes, round holes, typed material, or any other, into the universal language of the five-channel punched tape. Where necessary, machines are also available to reconvert the common language tape to the language of a particular machine. In other words it is now possible to obtain and use the following:

1. Common language tape can be produced as a by-product of an original entry on:

A--Key punch machine of each manufacturer

B--Electric typewriter or adding machine

C--Billing or posting machine

D--Telegraphic receiver

The tape is produced simultaneously with the document. No further passage through any machine is necessary.

2. Common language tape can be produced as a later step, by passing:

A--80-column cards (IBM)

B--90-column cards (Remington-Rand)

through a card-to-tape convertor.

3. Common language tape can also be created by a tape-creating unit, similar to a typewriter. It can be duplicated in the same manner.

4. Common language tape can be used directly in most electronic computers.

5. Common language tape can be converted to:

A--80 column cards (IBM)

B--90 column cards (Remington-Rand)

through the use of a tape-to-card convertor.

6. Common language tape can be used as the "input" to activate:

A--Electric typewriters

B--Billing or posting machines

C--Key punch machines of each manufacturer

D--Telegraphic sending units

E--Calculating machines

It should be noted that these are only some of the ways in which the common language five-channel punched paper tape may be used in the machanized office. There are, of course, new applications being thought of and there will be more uses developed in the future. More and better machines and equipment will be developed which will do more work in a shorter amount of time. The field of office automation has not yet reached its pinnacle; it is still in the throes of an office industrial revolution.

To date, the chain supermarket industry has not taken full advantage of the newest advances in electronic computers and integrated data processing. Perhaps one reason for this may lie in the cost of buying and renting the necessary equipment. Another reason may be the lack of knowledge of the potential benefit which can be derived from the use of the new systems. From the data presented herein, a number of specific applications can be derived which dovetail

with current chain supermarket operating procedures, and which may improve these procedures.

One food organization has placed an order for one of Remington Rand's new "Univac File Computer" systems which will completely revolutionize its inventory control system.[23] The machine system, which consists of fifteen different pieces of equipment, is capable of keeping tab of more than three thousand items stocked by the firm's warehouse. When required, the system prints a "book inventory" by item, in about thirty minutes. With present methods, using the tub file inventory system, this takes over two hundred man hours. As an aid to buyers, there will be an "inquiry keyboard" in the buying offices. In order to ascertain the exact number of cases of a particular item on hand, the buyer punches the commodity number on the keyboard, and the quantity appears on a screen. The warehouse, too, will have a similar keyboard which operates by the same principles. It will be used to inform the warehouse personnel of the exact slot location of any item, and the quantity in the particular slot or slots. The machine itself "notifies" the buying department when any product has reached the minimum reorder level, or is exhausted from stock. In addition, the brain also types purchase orders for specified commodities, when they reach the minimum reorder level.

---

[23]Remington Rand Division, Sperry Rand, Inc., "How a Food Chain Will Use the New Univac File Computer" (New York: Remington Rand Division, Sperry Rand, Inc.)

As well as performing all these inventory control functions and assisting the buyers and the warehouse with stock control, the File Computer, with other punch card equipment, will also perform all billing, sales analysis, and general accounting computations.

There are a great many records which are commonly prepared in the offices of a chain supermarket firm, for use within various departments, that are later used in the tabulating department for report and statement preparation. Without the use of integrated data processing techniques, almost every one of these reports must be manually constructed. -- .not once, but twice. In their original form, they are typed or posted on a bookkeeping machine. An example of this type of report is the posting of detail transactions to store record cards. This data is the basis for store operating statements which may be prepared on tabulating equipment. It is necessary to manually key punch this data into cards before it can be used by the tabulating department. If the medium of the common language five-channel punched paper tape is an accessory to the original data processing machine. -- .in this case the typewriter or posting machine. -- .there is no need for further key punching. In addition to cost reduction, the chance of human copying error is also eliminated. -- .with a new saving to management of time, as well as potential financial loss.

In a punched card payroll operation, the original data is created twice. -- .once by the personnel department

for their records, and a second time by the tabulating department to create its master card. With the use of a punched tape attachment to the personnel department's typewriters, this duplication of effort is eliminated. A tape-to card convertor prepares the necessary cards from the punched tape, with a decrease in cost and an increase in accuracy.

There are a number of other tasks which supermarket chain organizations can adapt to electronic computer equipment and integrated data processing. Wherever and whenever there is a need for the same basic data to be used in more than one operating function, integrated data processing has possibilities for application.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

The chain supermarket field and the tabulating machine industry are both involved in a period of rapid growth. The advances in machine techniques being developed by the tabulating machine field can be of great aid and assistance to the continued growth of the chain supermarket field. It has been the purpose of this thesis to indicate the methods and procedures by which tabulating equipment can aid chain supermarket management in obtaining data accurately and expediently. With the cooperation of men representing the food chain industry and the tabulating equipment manufacturers, the needs of the supermarket field and the abilities of the machines were woven together. The procedures that resulted appear to indicate that tabulating equipment is well suited to the chain supermarket field, and that tabulating procedures can be used effectively in the field.

Machines will never take the place of men, since machines do not have the ability to think. Men, however, no longer need to devote their mentality to performing the tasks which machines can perform more quickly and more accurately than can men themselves. It is in this area of performing manual clerical and paperwork functions that tabulating equipment has made one of its greatest strides. The chain supermarket field, as well as all other fields of endeavor in business and industry, will forever be grateful

to the men who created a true "right hand" for the business executive. .-- .the "mechanical hand" embodied in the tabulading machine.

The previous chapters have attempted to portray the mechanical means by which day-to-day office routines of the chain supermarket field may be performed by the introduction of tabulating devices. The most common of these routines, such as inventory control and billing procedures, accounts payable calculations, purchasing department and personnel department routines, and general bookkeeping, were used as examples to aid in the understanding of the ability and versatility of the equipment involved. This thesis has attempted to show that tabulating equipment can aid immeasurably in producing valuable statistics and operating data for chain supermarket operators. From survey data and personnel interviews, the author reached the conclusion that even those firms which had installed punched card equipment were not making full use of it. This opinion led to the inclusion of several examples of procedures which can be adapted to punched cards, rather than limiting the discussions to one or two procedures.

This material is presented in order to provide a source of enlightenment on the subject of tabulating equipment as it may serve the chain supermarket industry. The possibilities and the potentialities of mechanization in chain supermarket offices are diverse and numerous. The speed with which data can be mechanically processed is of

vital importance to the executives of most supermarket chain organizations, since they often need operating and statistical data as soon as possible after the data is created by the operating departments of the firm. If tabulating equipment can provide data in a shorter length of time than can manual methods, then most chain executives are interested in the details of this equipment. The speed of one machine in listing data has been compared to the speed of twenty-five typists.[24] If this is assumed to be correct, additional information about the uses of the equipment and its application to the chain supermarket field may be desired. It is hoped that this thesis will serve as one segment of that desired information.

---

[24]Interview with Joseph Gentile, July, 1956.

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

Appel, R. W., et al. Electronic Business Machines--A New Tool for Management. Boston: Harvard Graduate School of Business Administration, 1953.

Dooher, M. J. (ed.) Electronic Data Process in Industry. New York: American Management Assciation, 1955.

Wasser, Stephen A. Accounting and Office Procedures--A Survey and Analysis in the Chain Supermarket Field. Schenectady, New York: Gershon Brothers, 1955.

Periodicals

Benjamin, J. F. "And so. . . .A Business was Born," The Punched Card Annual, Vol. 4. Detroit: The Punched Card Publishing Company, 1955, pp. 186-188.

Newspapers

Supermarket News, February 6, 1956

Records and Procedures

ACF-Wrigley Stores, Inc., Detroit, Michigan.

Central Markets, Inc., Schenectady, New York.

Pamphlets and Brochures

International Business Machine Corporation, "Card Order Plan," Form #32-6698.

_____. "IBM Accounting--Warehouse Control for the Grocery Industry," New York, 1949, Form #22-3760-0.

_____. "Pre-billing in the Chain and Wholesale Grocery Field," Form #32-6420-0 (1043P).

_____. "604 Electronic Calculating Punch for Billing and Inventory Control," Form #32-8601-1 (932P).

_____. "Warehouse Inventory Control for Chain Grocery Companies," Form #32-6318-0 (644P).

National American Wholesale Grocers' Association, Inc., "Memo #118-A." New York: July 9, 1955.

Nielsen, A. C. Company. The Nielsen Report to Retail Food Stores. Chicago: A. C. Nielsen Company, 1955.

Remington Rand Division, Sperry Rand, Inc. "For Common Language Punched-Card Procedures," #TM 841 Rev.

_____. "How A Food Chain Will Use the New Univac File Computer," #TM 971.

_____. "New Management Control Plan for Food Distributors for Inventory Control, Billing, and Sales Analysis," Management Controller #791.

_____. "Punched-Card Methods for a Food Distributor," #TM 977.

_____. "Revolutionizing the Making of Punched-Card Extensions," Bulletin P-10, #TM 213E.

_____. "Two Steps in One With the Record Sort," #TM 616.1A.

_____. "Wholesale Grocery Inventory Control, Billing, and Sales Analysis with Remington Rand Punched-Card Accounting," #TM 745.

Wheeldex and Simpla Products, Inc. (company catalog) New York: 1956.

The Wright Line, (company cataglog) Worcester, Massachusetts.

Correspondence and Interviews

Gentile, Joseph. Director of Tabulating, ACF-Wrigley Stores, Inc., Detroit, Michigan.

Lishawa, A. W. Manager, Chain and Wholesale Department, International Business Machines Corporation, New York.

McDermott, Joseph. Partner, Hotaling-McDermott Company, Food Brokers, Albany, New York.

Wasser, Harry. Director of Purchases, Central Markets, Inc., Schenectady, New York.

APPENDIX

Chain Supermarket Controllers and Office Managers Who Provided Information Through Correspondence

Gilliland, T. R. Eisner Grocery Company. Champaign, Illinois: December 6, 1955.

Hayden, Ralph F. King Kullen Grocery Company, Inc. Jamaica, New York: December 20, 1955.

Hovey, D. H. The Market Basket Corporation. Geneva, New York: December 5, 1955.

Johnson, W. T. Colonial Stores, Inc. Columbia, South Carolina: December 20, 1955.

Korklin, Edwin A. Miller's Super Markets, Inc. Denver: December 6, 1955.

Loft, Clifford W. Hinky-Dinky Food Stores. Omaha: December 7, 1955.

Peterson, C. L. Clark's Super Markets. Los Angeles: December 5, 1955.

Scott, F. D. Red Owl Stores, Inc. Minneapolis: December 8, 1955.

Torey, S. W. Central Markets, Inc. Schenectady, New York: December 16, 1955.

Chain Supermarket Personnel Who Provided Information Through Personal Interviews

Gentile, Joseph, Director of Tabulating, ACF-Wrigley Stores, Inc., Detroit, Michigan.

Grosberg, Merwin, Vice-President, ACF-Wrigley Stores, Inc., Detroit, Michigan.

Grabkowski, Edward, Assistant to the Controller, Central Markets, Inc., Schenectady, New York.

Melenofsky, Walter, Tabulating Machine Supervisor, ACF-Wrigley Stores, Inc., Detroit, Michigan.

Plotnik, Maxwell, Director of Personnel, Central Markets, Inc., Schenectady, New York.

Torey, S. W., Controller, Central Markets, Inc., Schenectady, New York.

Wasser, Harry, Director of Purchases, Central Markets, Inc., Schenectady, New York.

Representatives of Tabulating Machine Manufacturers Who Provided Information Through Personal Interviews and Correspondence

Kimling, James, Sales Representative, International Business Machines Corporation, Lansing, Michigan.

Kogan, Sidney, Sales Representative, Remington Rand Division, Sperry Rand Corporation, Detroit, Michigan.

Lishawa, A. W., Manager, Chain and Wholesale Department, International Business Machines Corporation, New York.

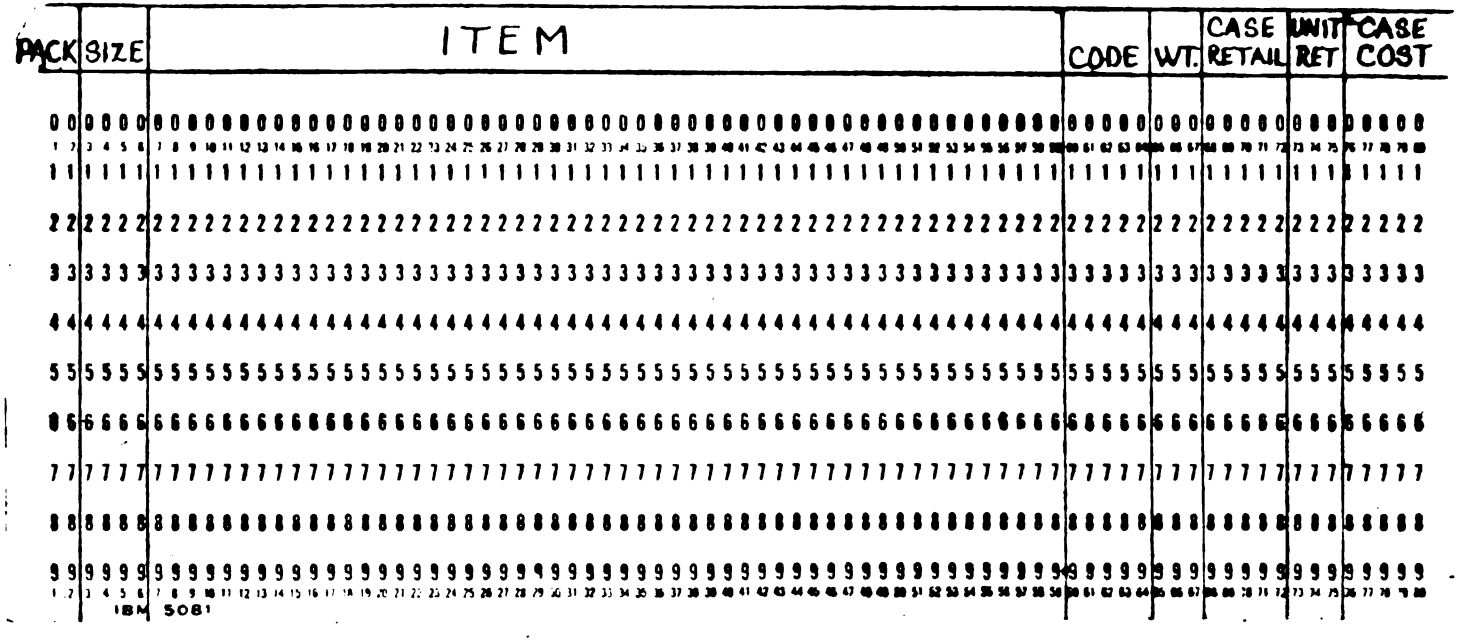


FIGURE 1

MASTER CARD - TUB FILE SYSTEM

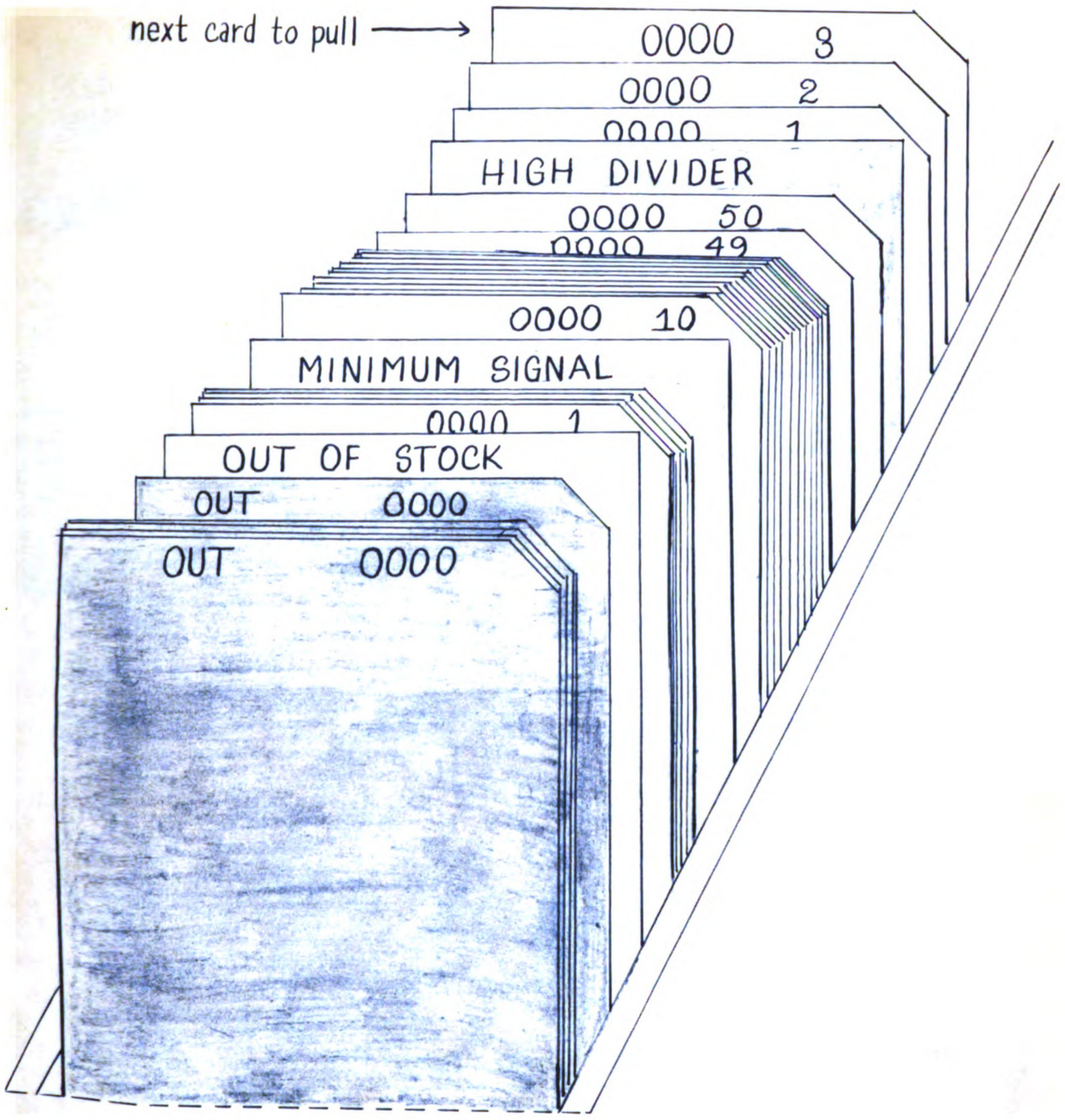


FIGURE 2

TUB FILE CARDS

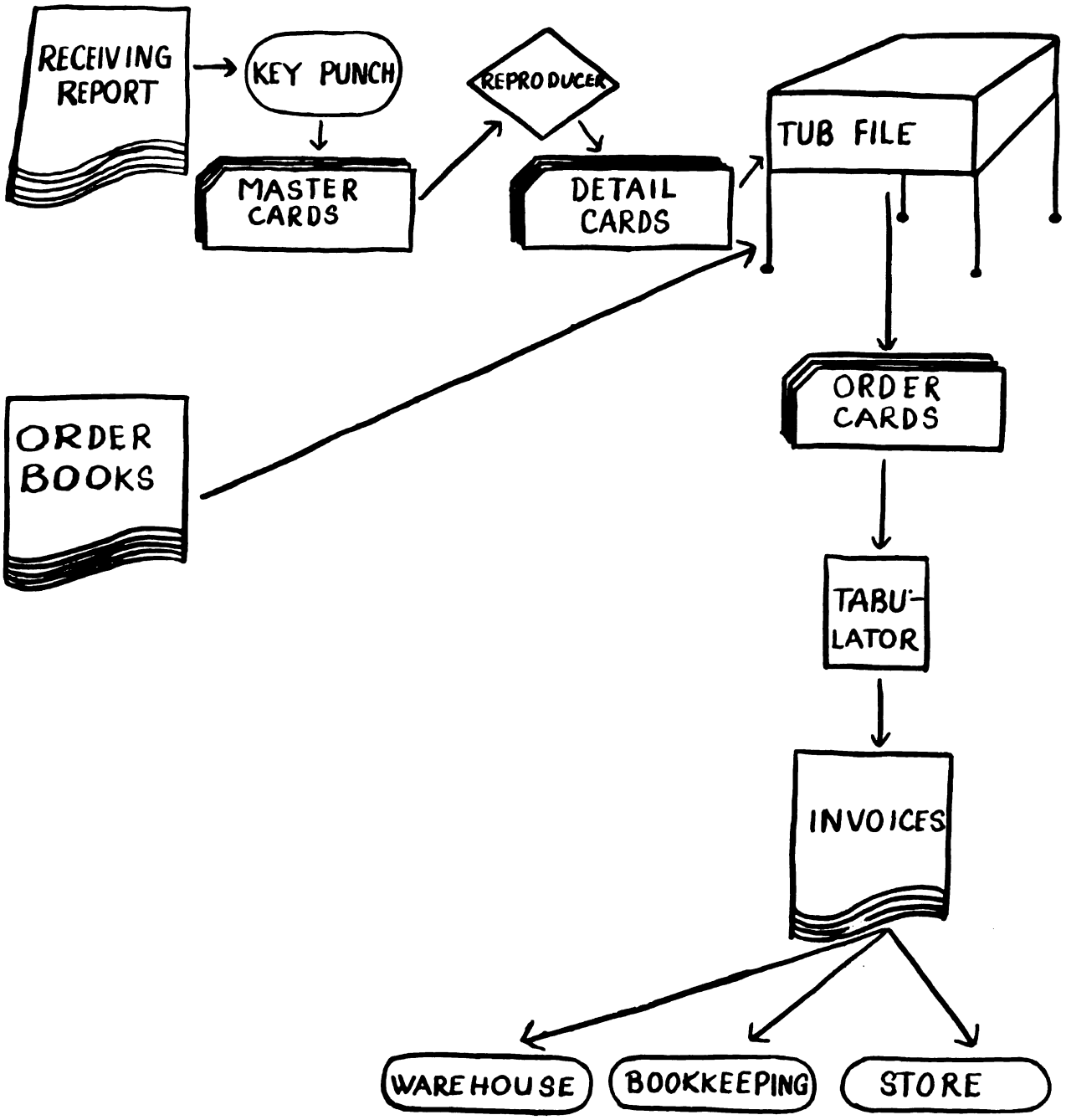
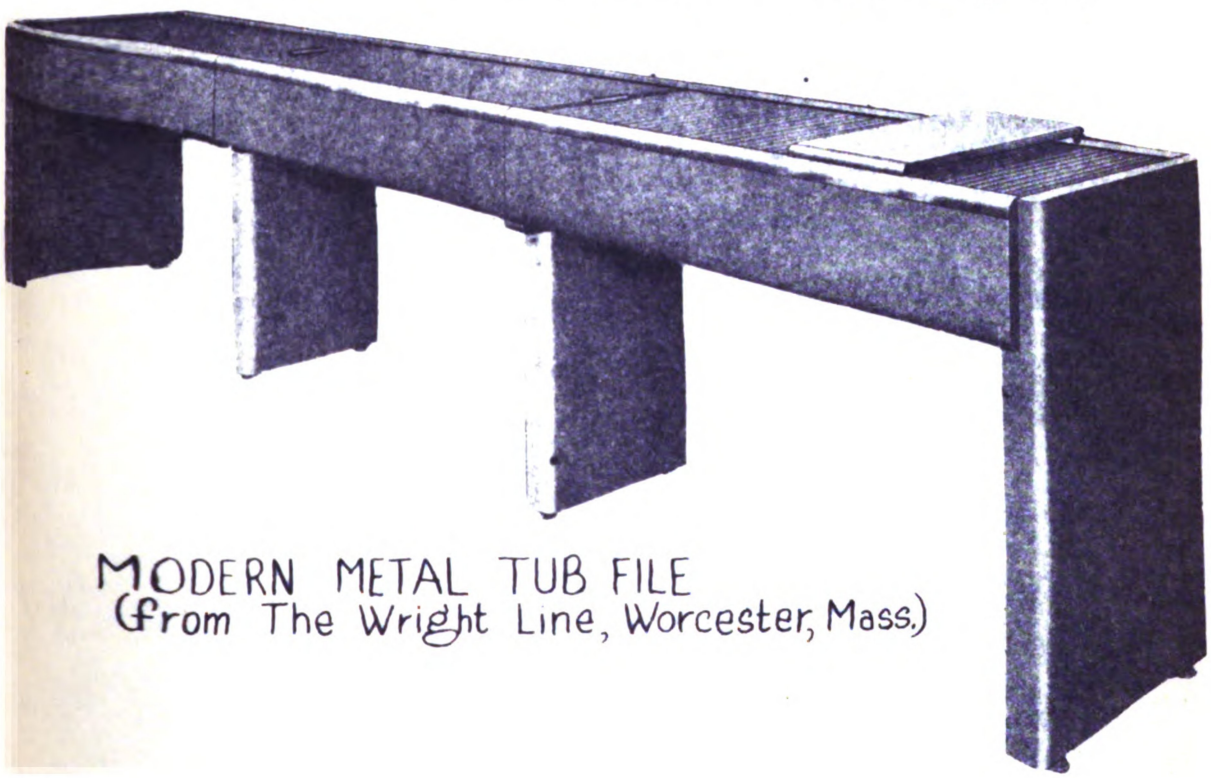


FIGURE 3

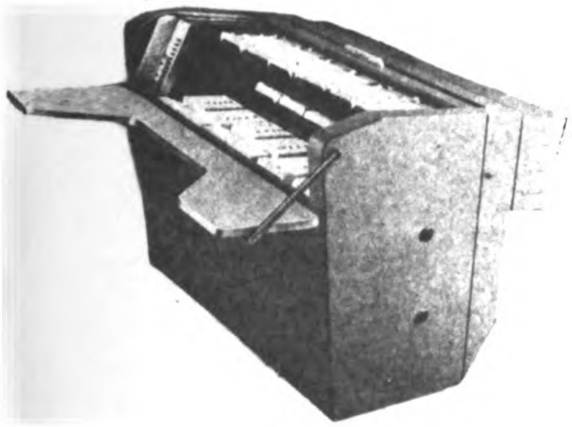
TUB FILE OPERATIONS

EARLY WOODEN TUB FILE
(from "The Punched Card Annual," Vol. 4, p. 186.)



MODERN METAL TUB FILE
(From The Wright Line, Worcester, Mass.)

FIGURE 4
STANDARD TUB FILES



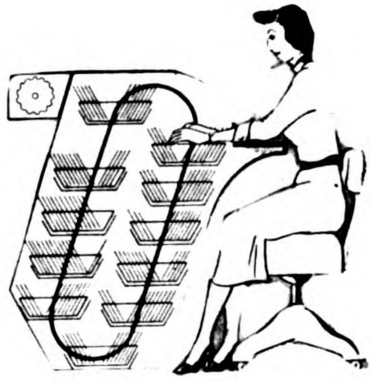
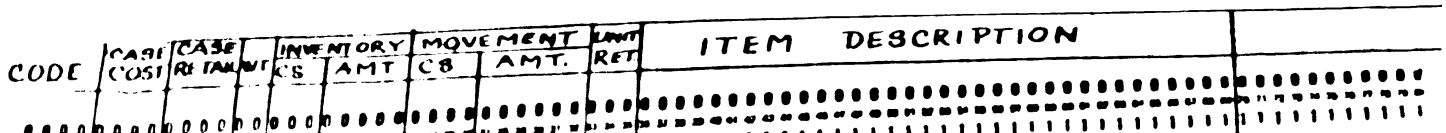


FIGURE 5
MECHANIZED TUB FILE
(from Wheeldex and Simpla Products, Inc., New York)


CODE
CASE COST
CASE RETAIL
UT
INVENTORY
CS
AMT
MOVEMENT
CS
AMT.
UNIT RET
ITEM DESCRIPTION

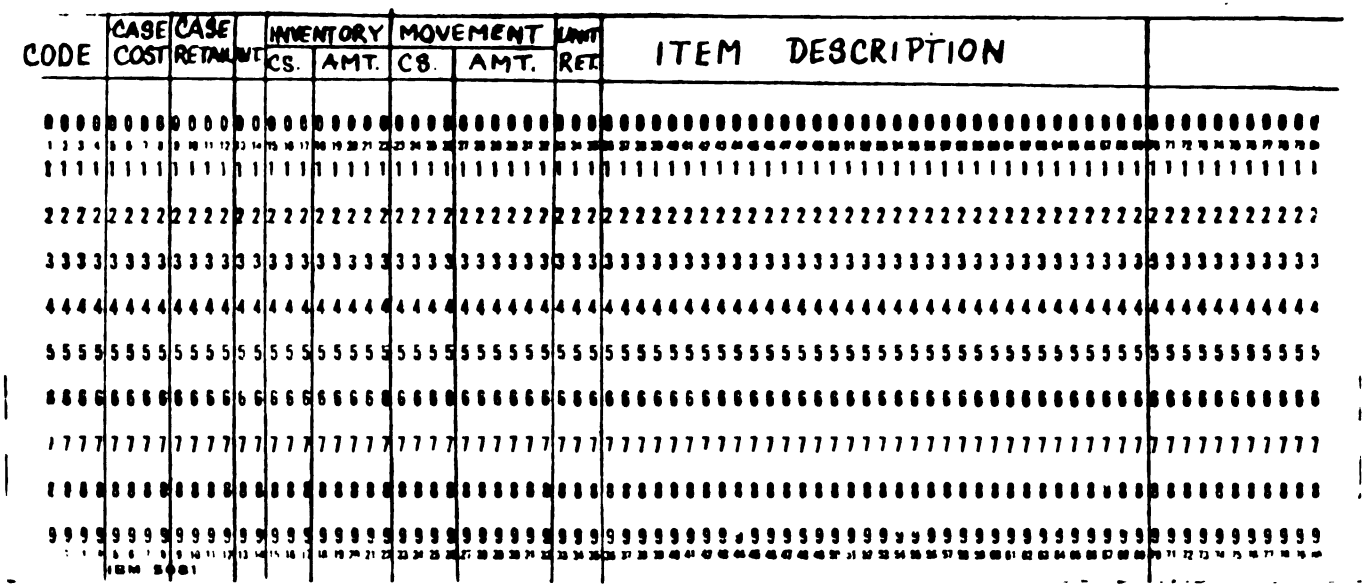


FIGURE 6

MASTER INVENTORY CARD - BATCH BILLING SYSTEM

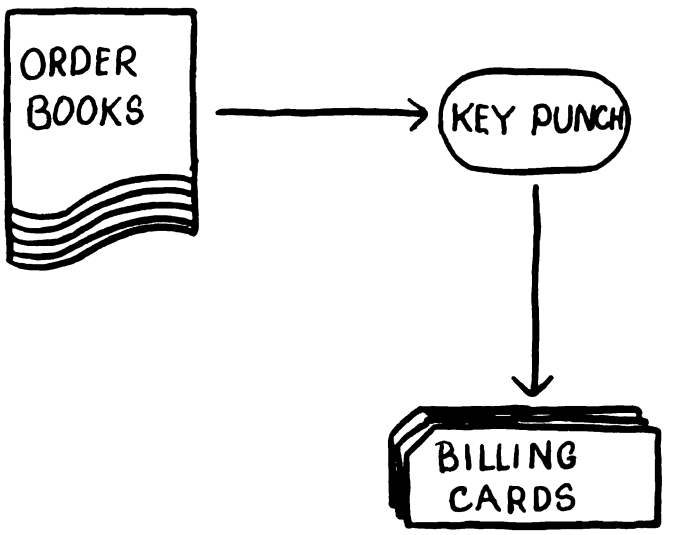


FIGURE 7

CREATION OF BILLING CARDS FOR
BATCH BILLING SYSTEM

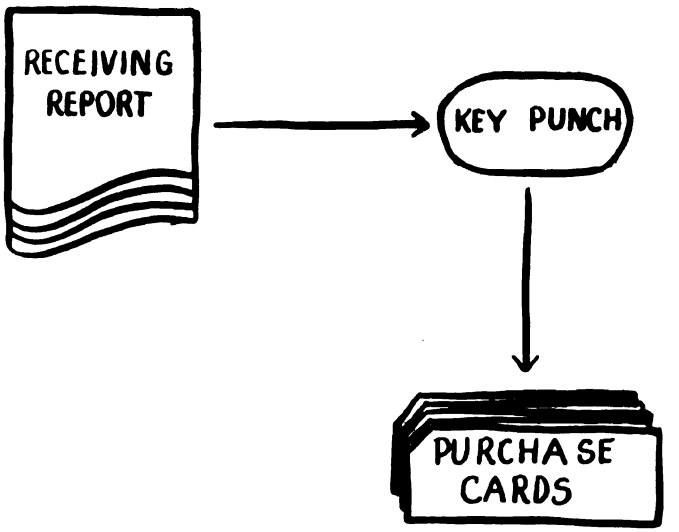


FIGURE 8

CREATION OF PURCHASE CARDS FOR
BATCH BILLING SYSTEM

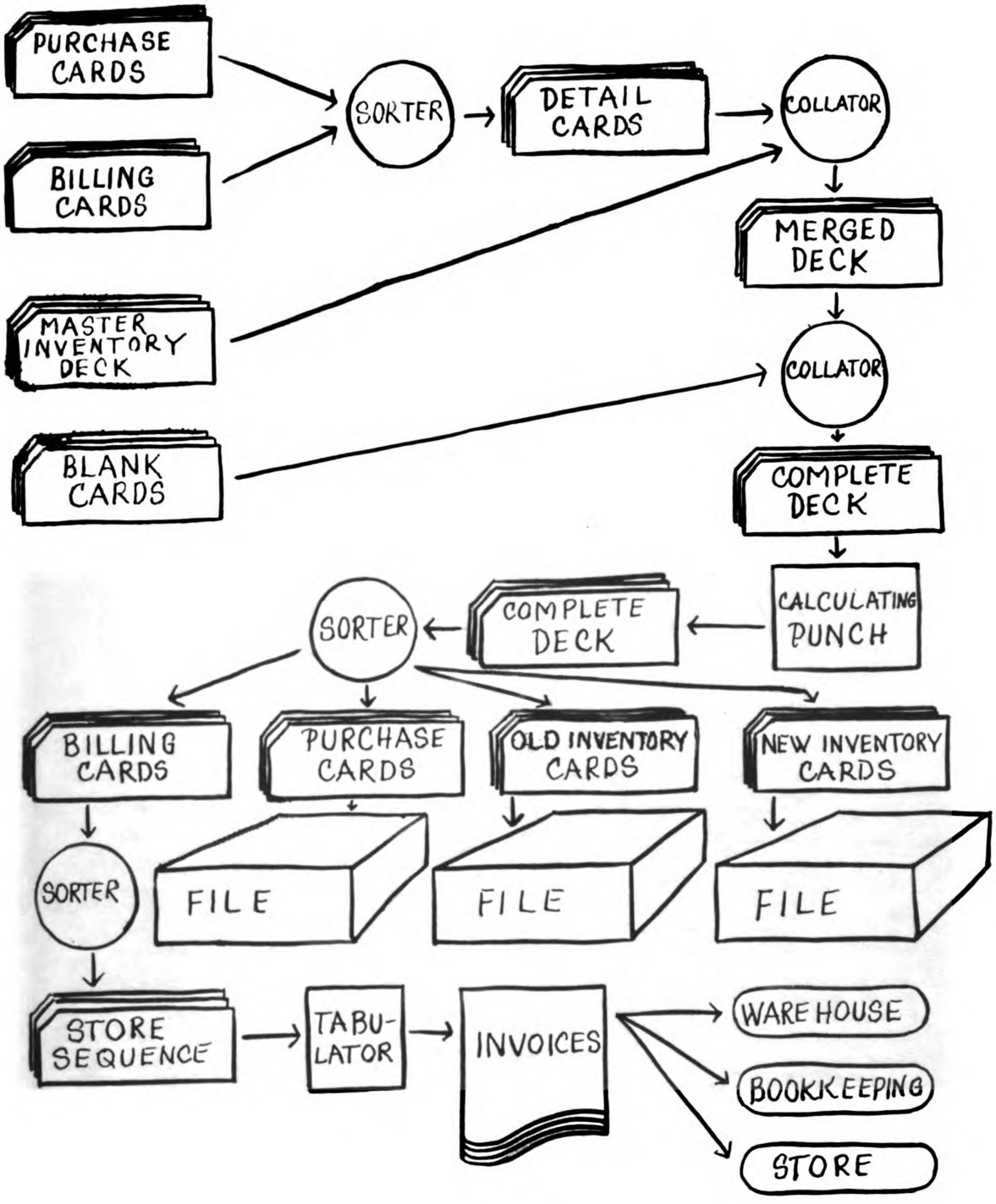


FIGURE 9

BATCH BILLING OPERATIONS

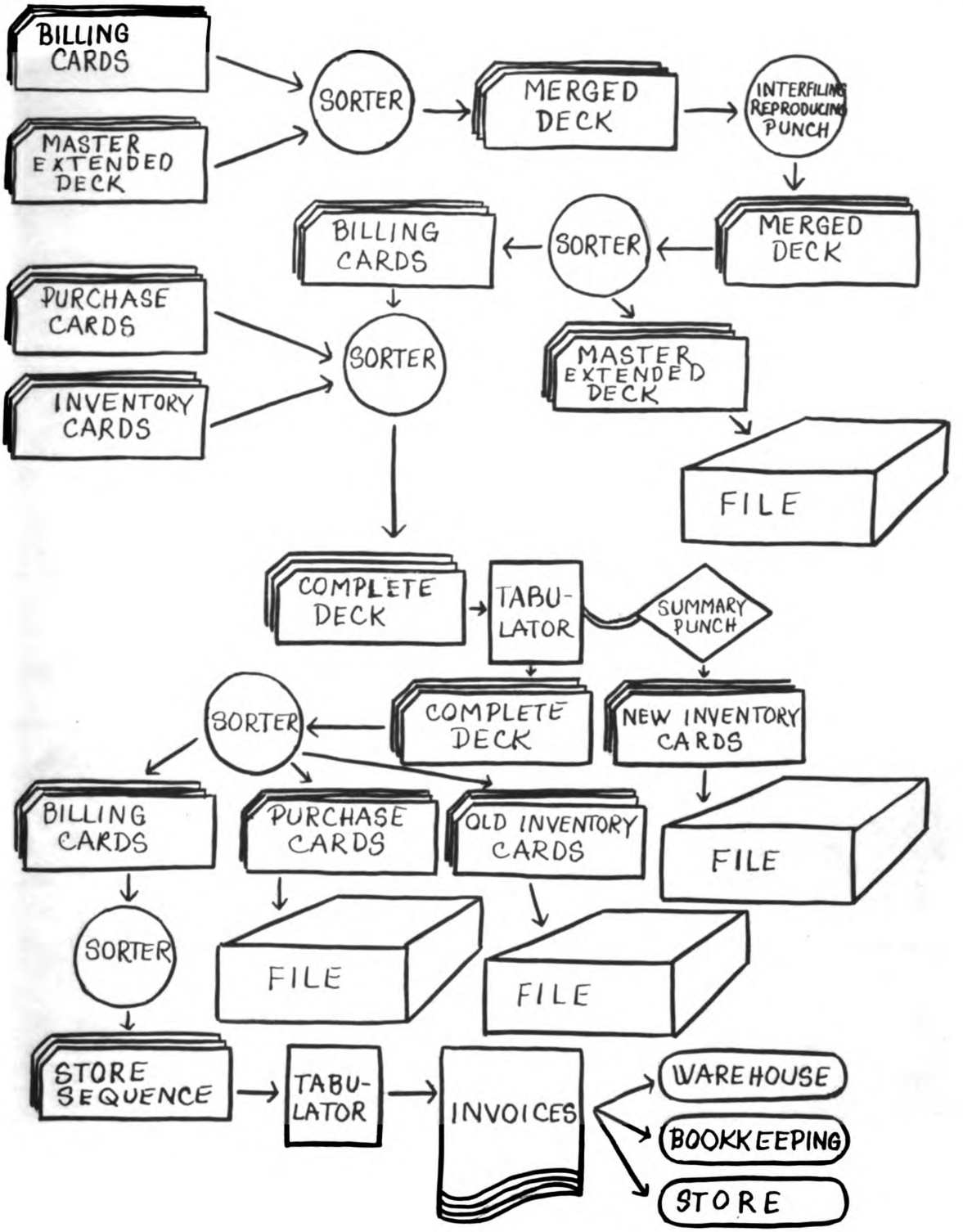


FIGURE 10

MODIFIED BATCH BILLING OPERATIONS

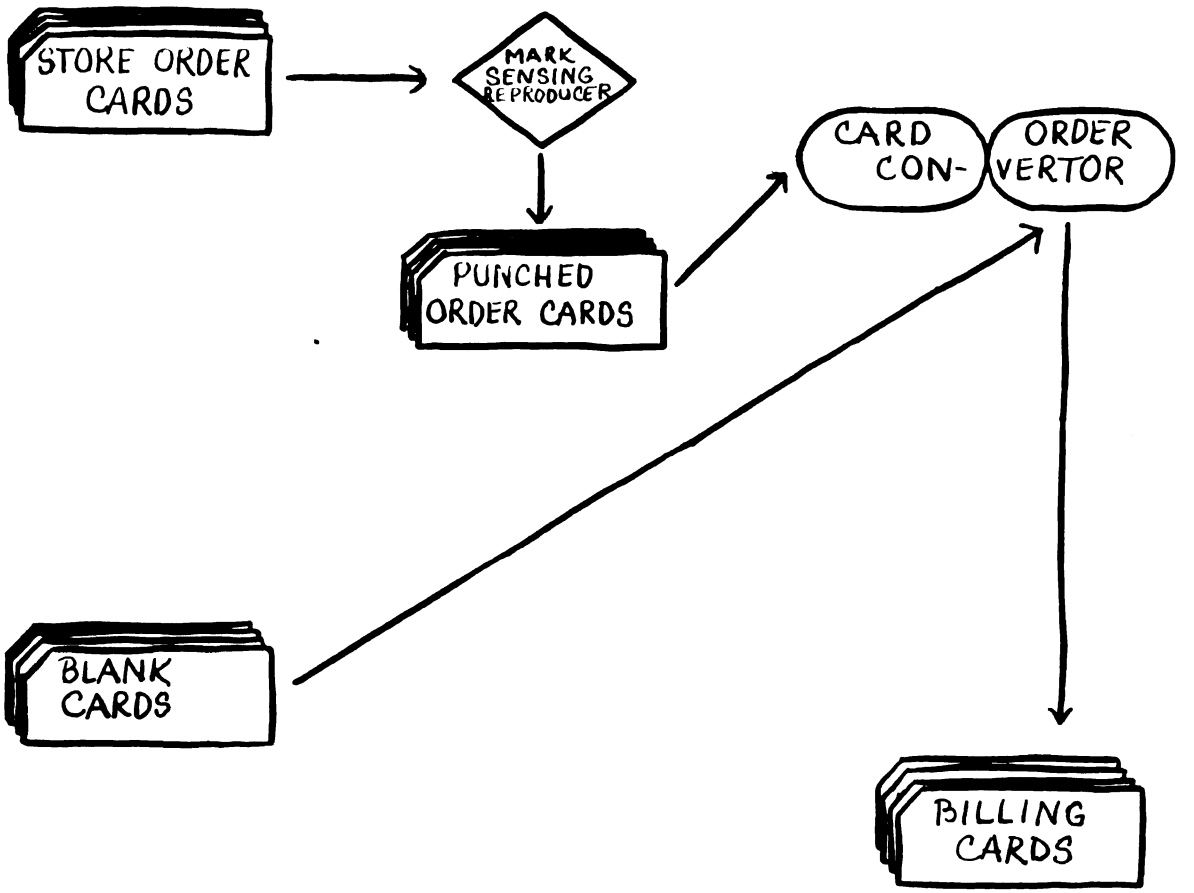


FIGURE 11

CREATION OF BILLING CARDS USING IBM CARD ORDER PLAN

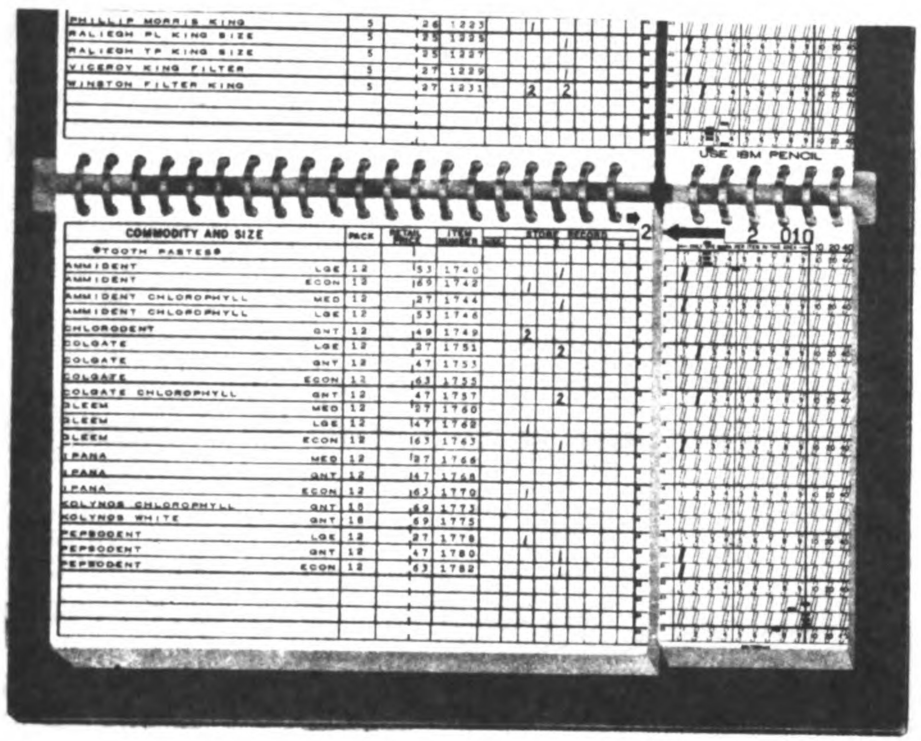


FIGURE 12

IBM CARD ORDER CATALOG

(from "Card Order Plan" - Form # 32-6698
International Business Machines Corp.)

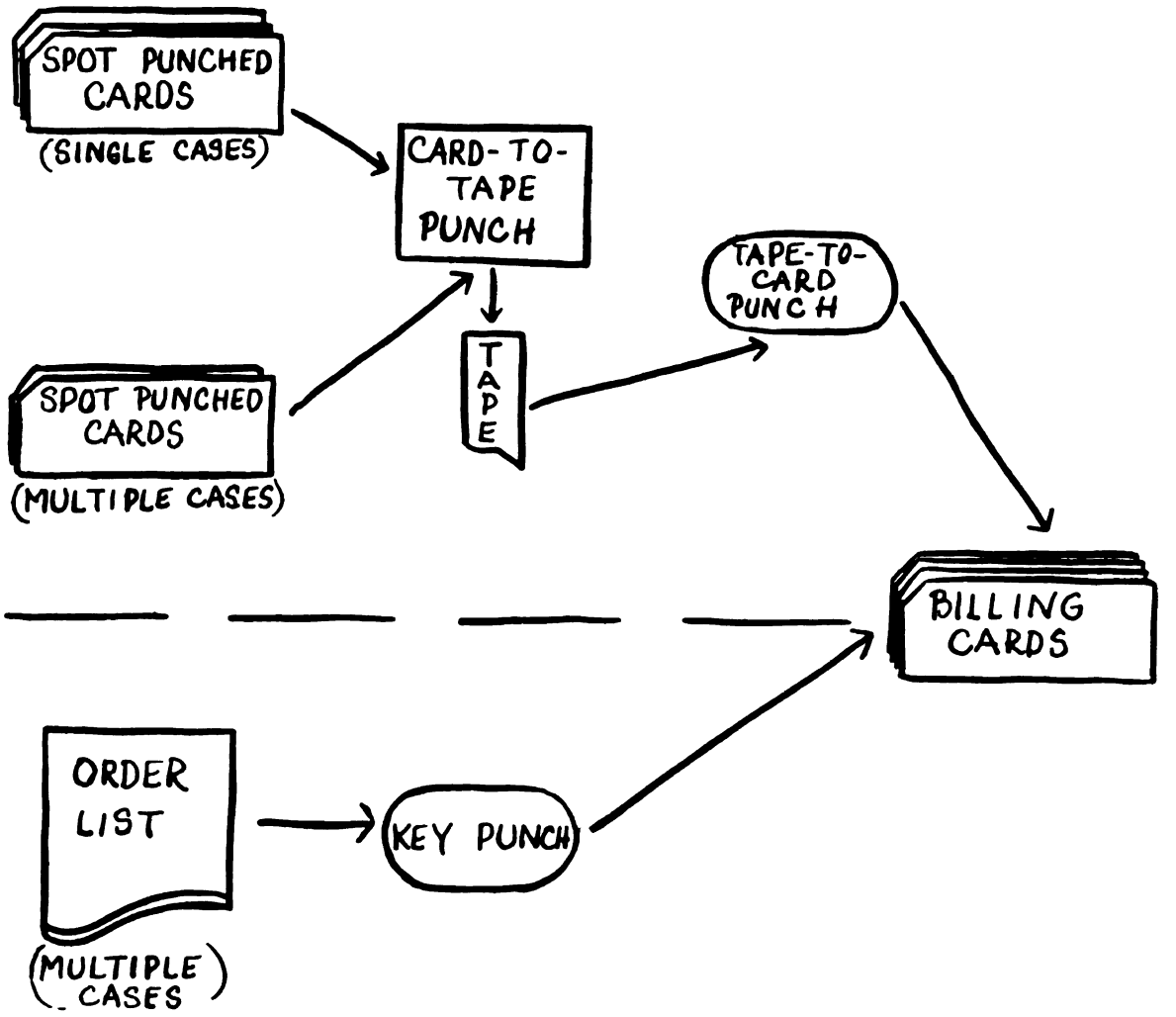
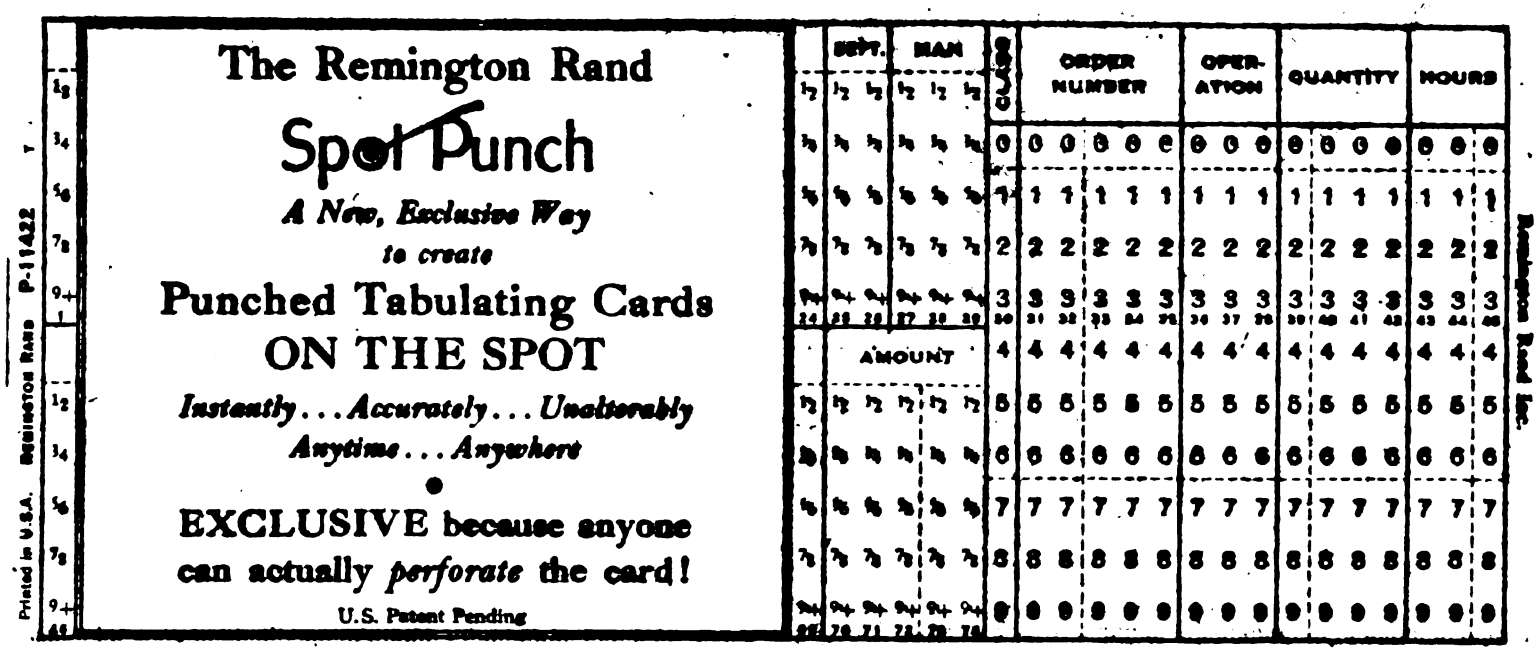


FIGURE 13

CREATION OF BILLING CARDS USING REMINGTON RAND SPOT PUNCH



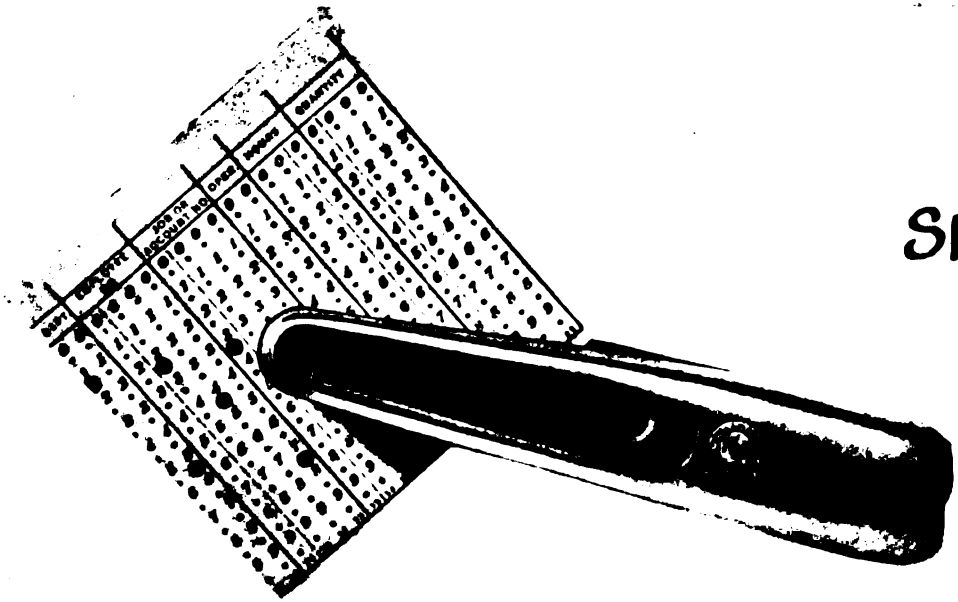


FIGURE 14
SPOT PUNCH CARD AND PUNCH

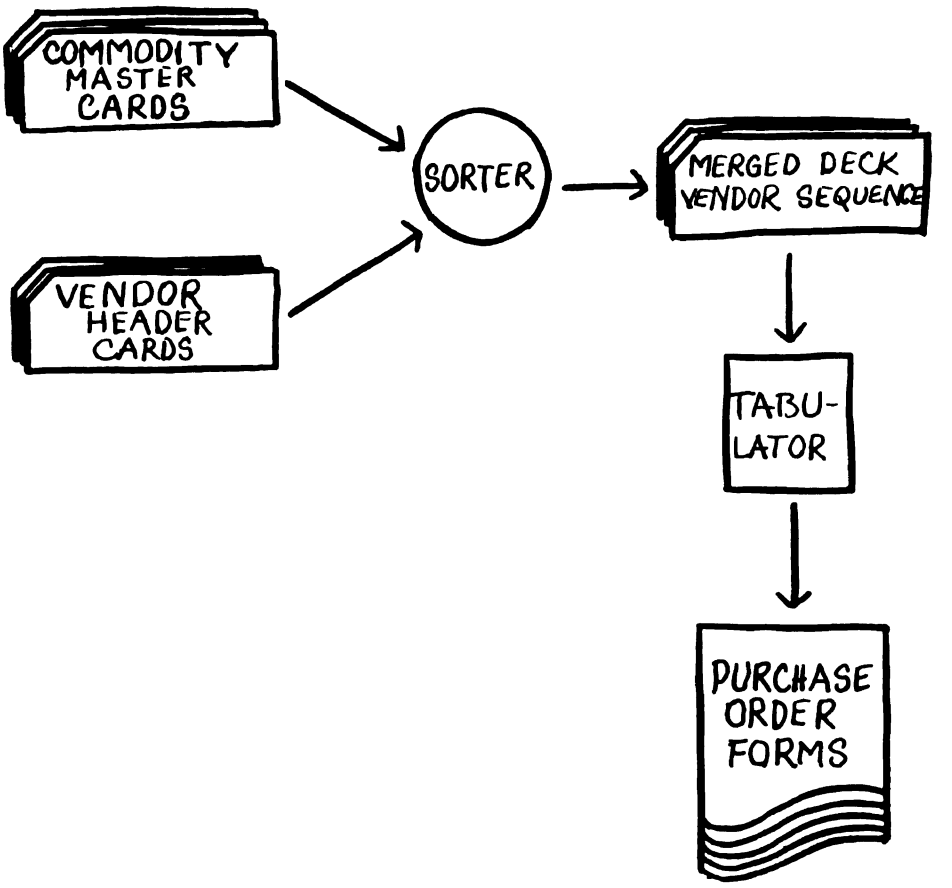


FIGURE 15

CREATION OF PURCHASE ORDER FORMS

VENDOR

MAIL INVOICE TO ▶

PURCHASE ORDER

THE GOLUB CORPORATION
140 ERIE BOULEVARD
SCHENECTADY, N.Y.

SPECIFY OUR ORDER NUMBER ON INVOICE

ORDER NO. 1

DATE _____

KINDLY SHIP QUANTITIES ORDERED TO WAREHOUSE AT:

126th ST. AND 2nd AVE.
TROY, N.Y.

SWAN AND PAINE STS.
GREEN ISLAND, N.Y.

SHIP VIA _____

SIGNED BY _____
PURCHASING DEPT.

QUANTITY ORDERED	ITEM CODE	ITEM DESCRIPTION	PACK AND SIZE	WHSE. SLOT NO.		OFFICE USE ONLY	WAREHOUSE RECEIPT

INC. SNOW HILL, MD.

FIGURE 16
PURCHASE ORDER FORM

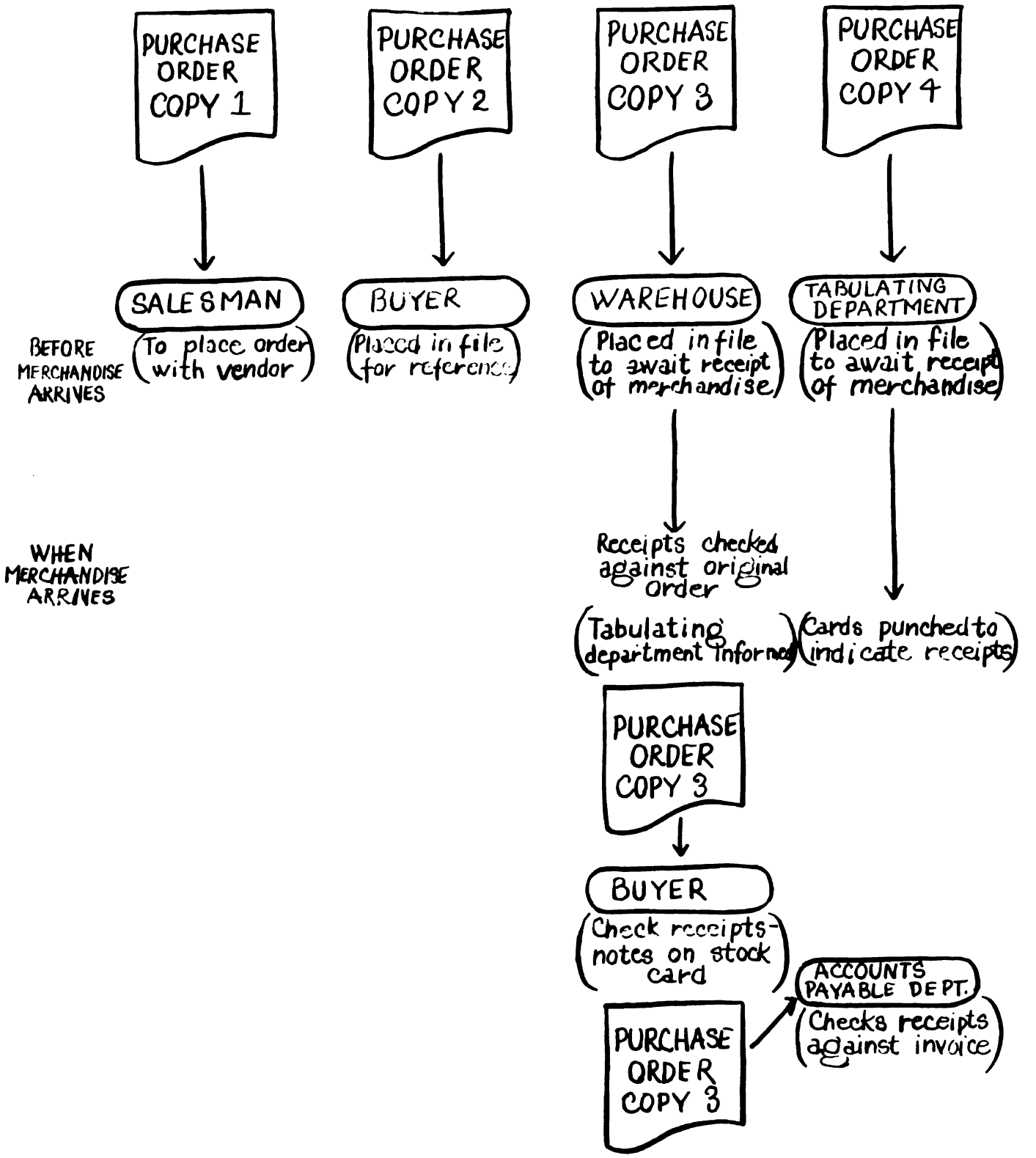


FIGURE 17

DISTRIBUTION AND USE OF PURCHASE ORDER FORMS

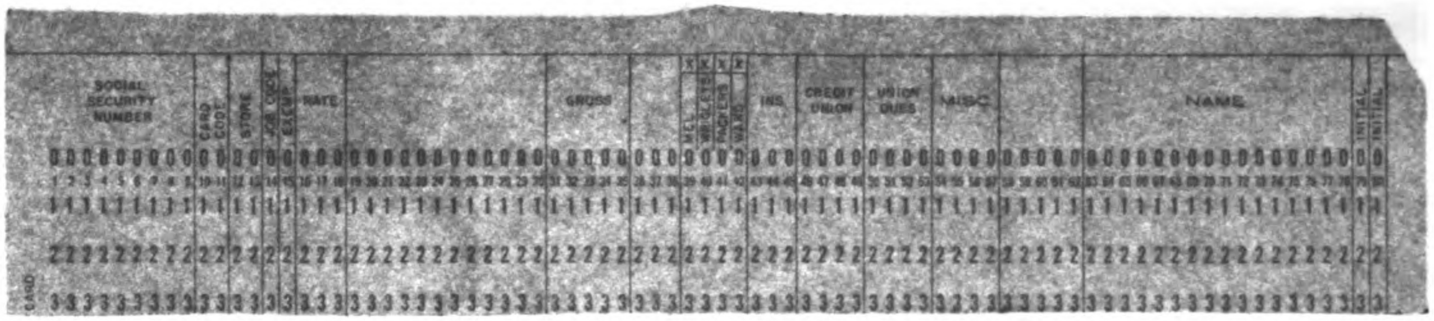


FIGURE 18
PAYROLL MASTER CARD

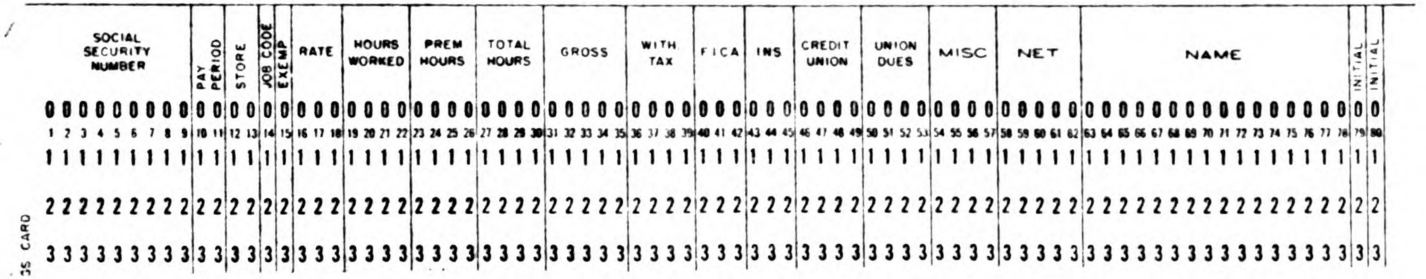


FIGURE 19
PAYROLL DETAIL CARD

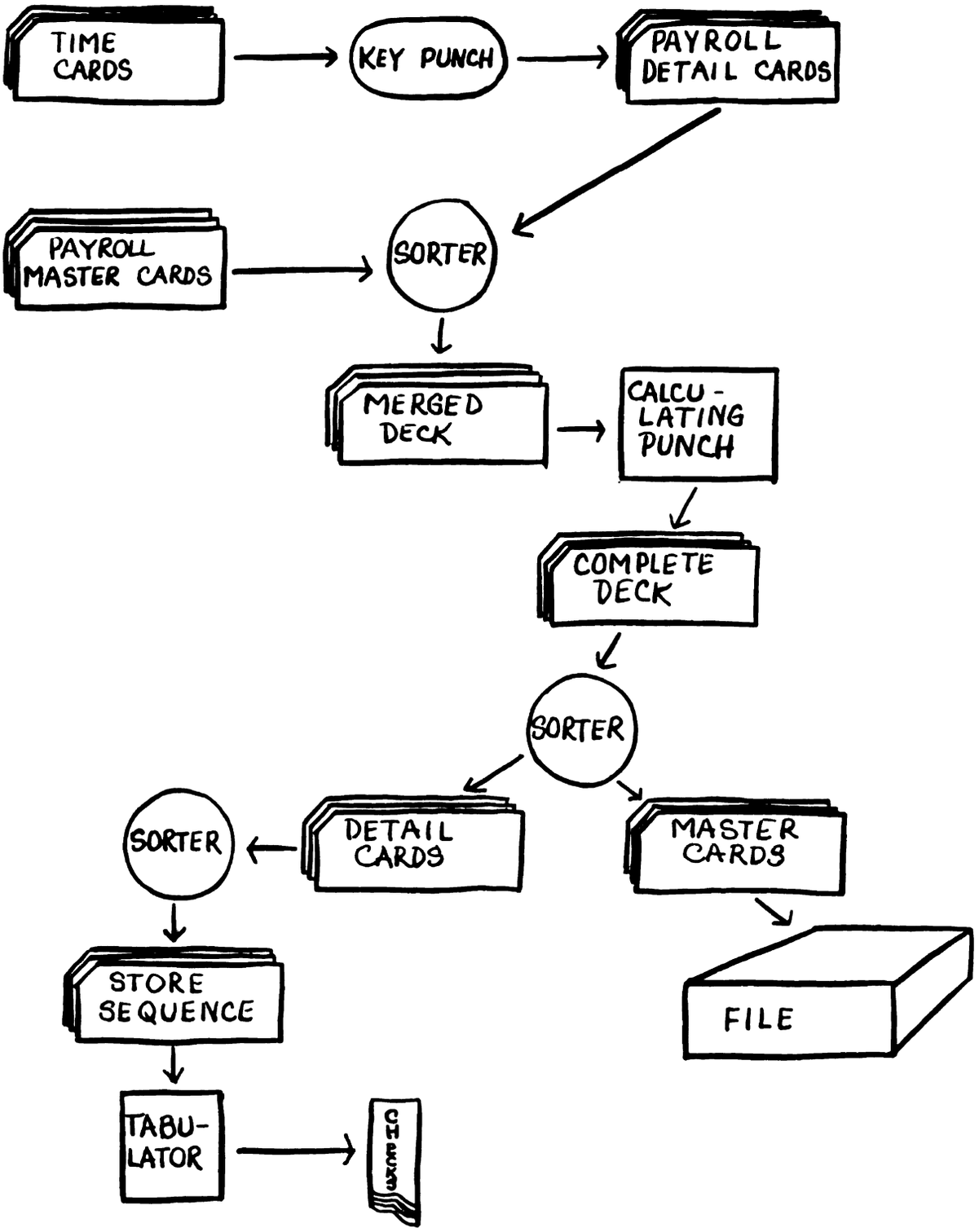


FIGURE 20

PAYROLL OPERATIONS USING CALCULATING PUNCH

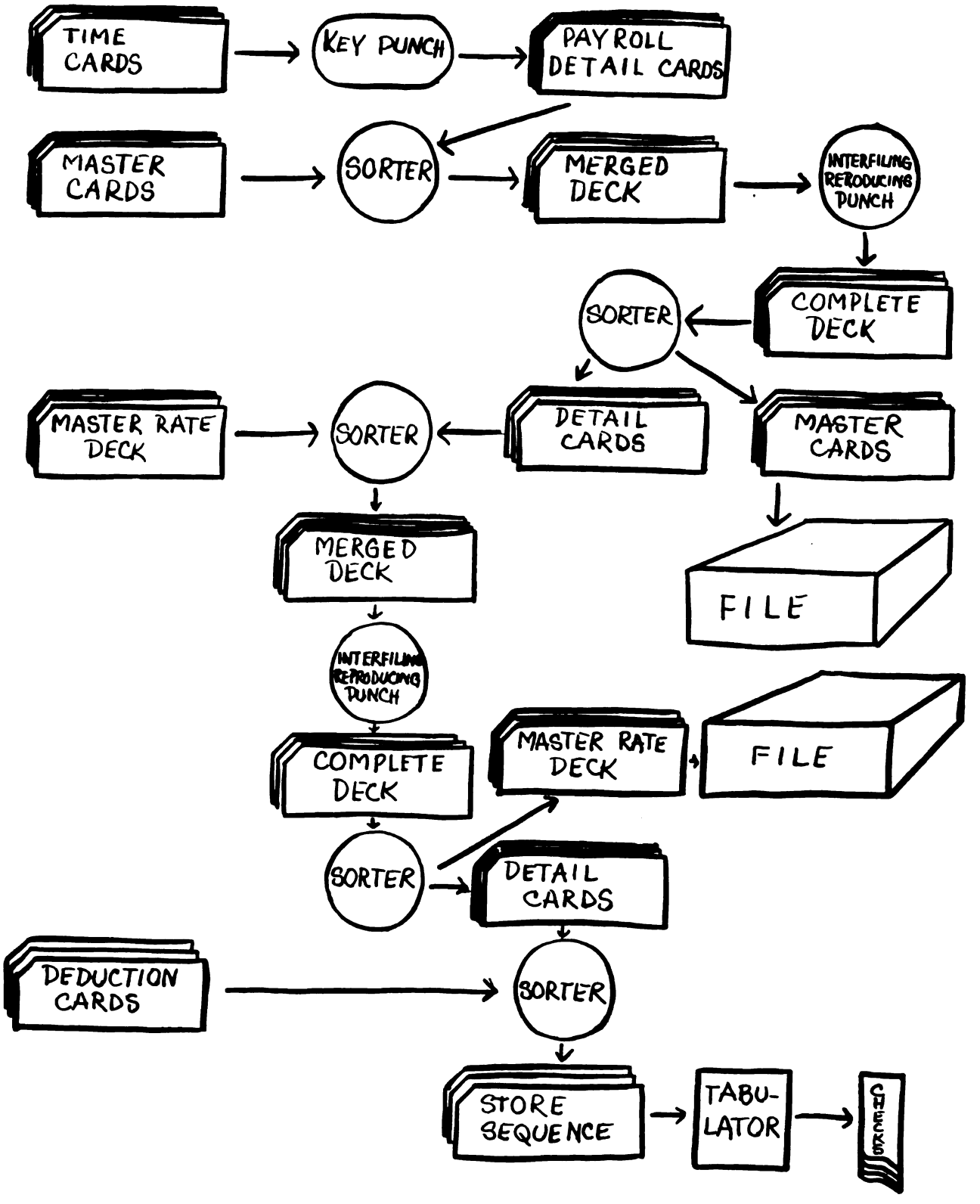


FIGURE 21

PAYROLL OPERATIONS USING MODIFIED SYSTEM

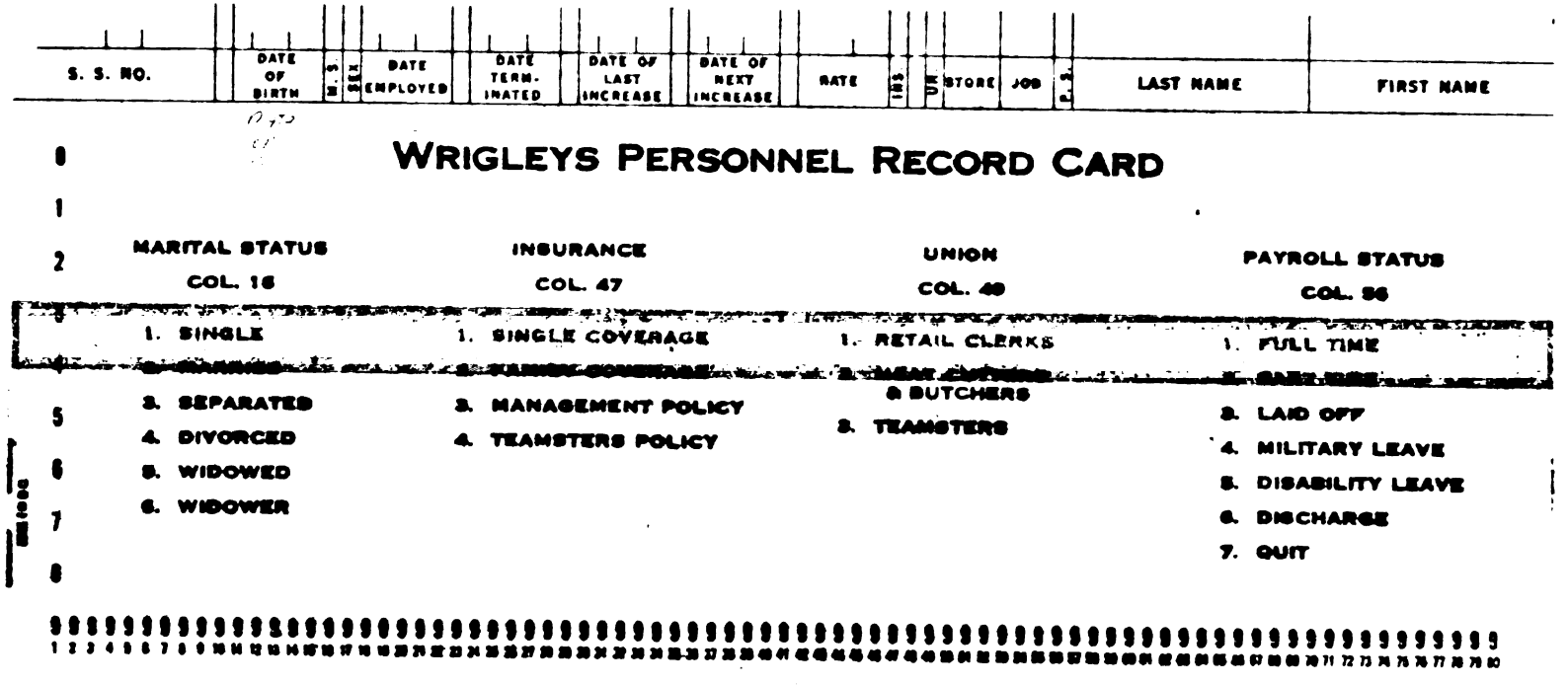


FIGURE 22
PERSONNEL RECORD CARD

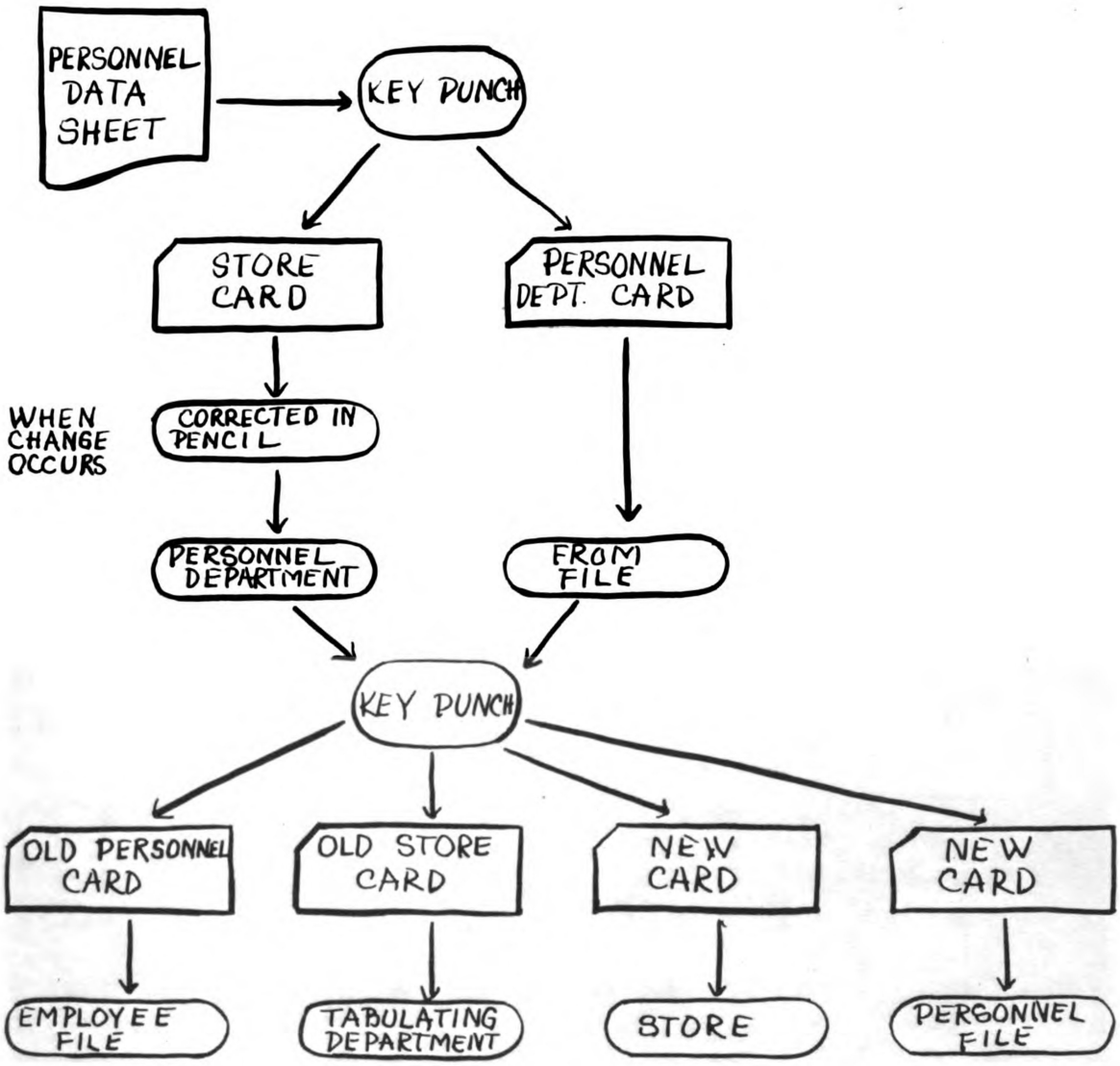


FIGURE 23

CREATION, DISTRIBUTION, AND USE OF PERSONNEL RECORD CARDS

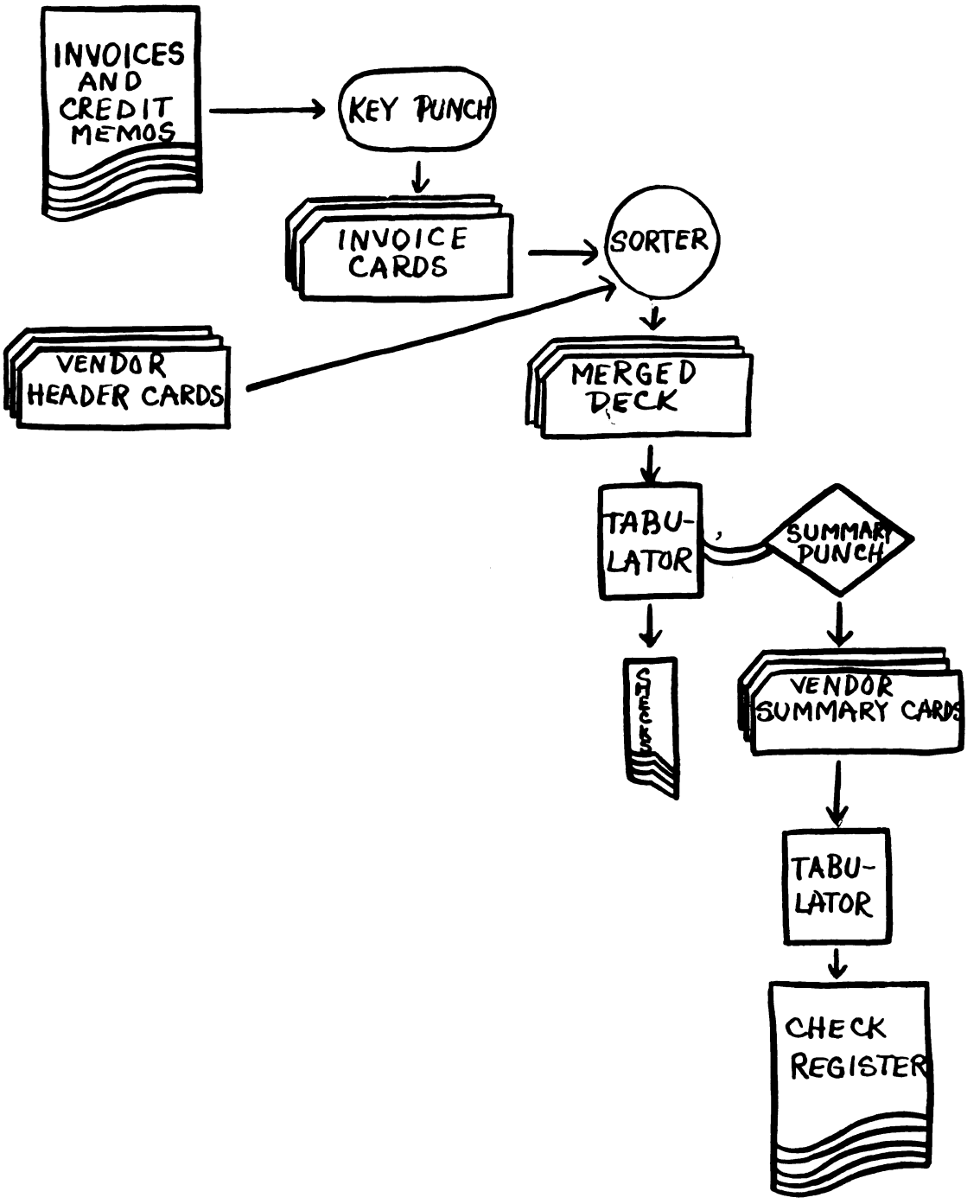


FIGURE 24

ACCOUNTS PAYABLE PROCEDURES

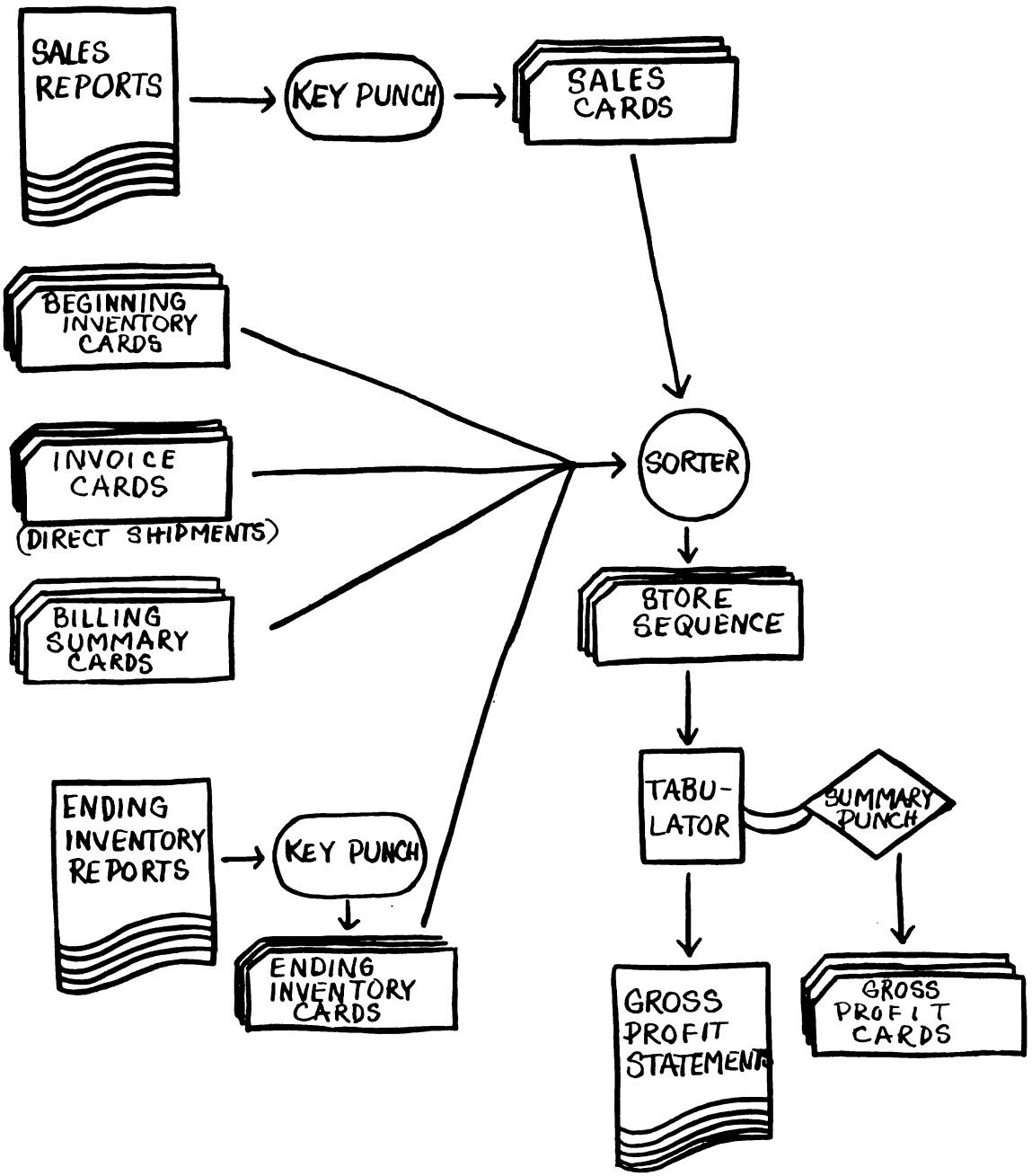


FIGURE 25

PREPARATION OF STORE GROSS PROFIT STATEMENTS

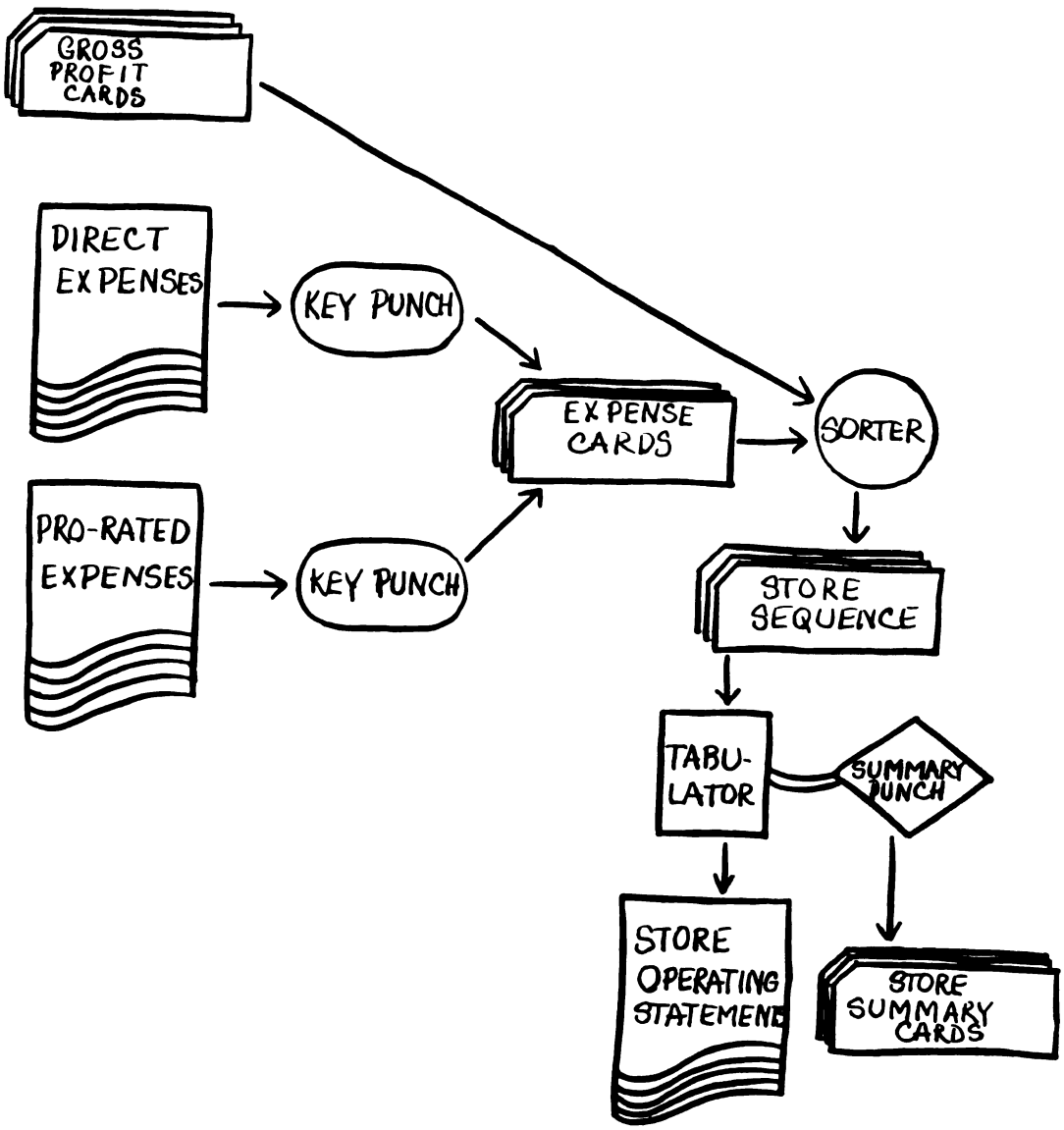


FIGURE 26

PREPARATION OF STORE OPERATING STATEMENTS

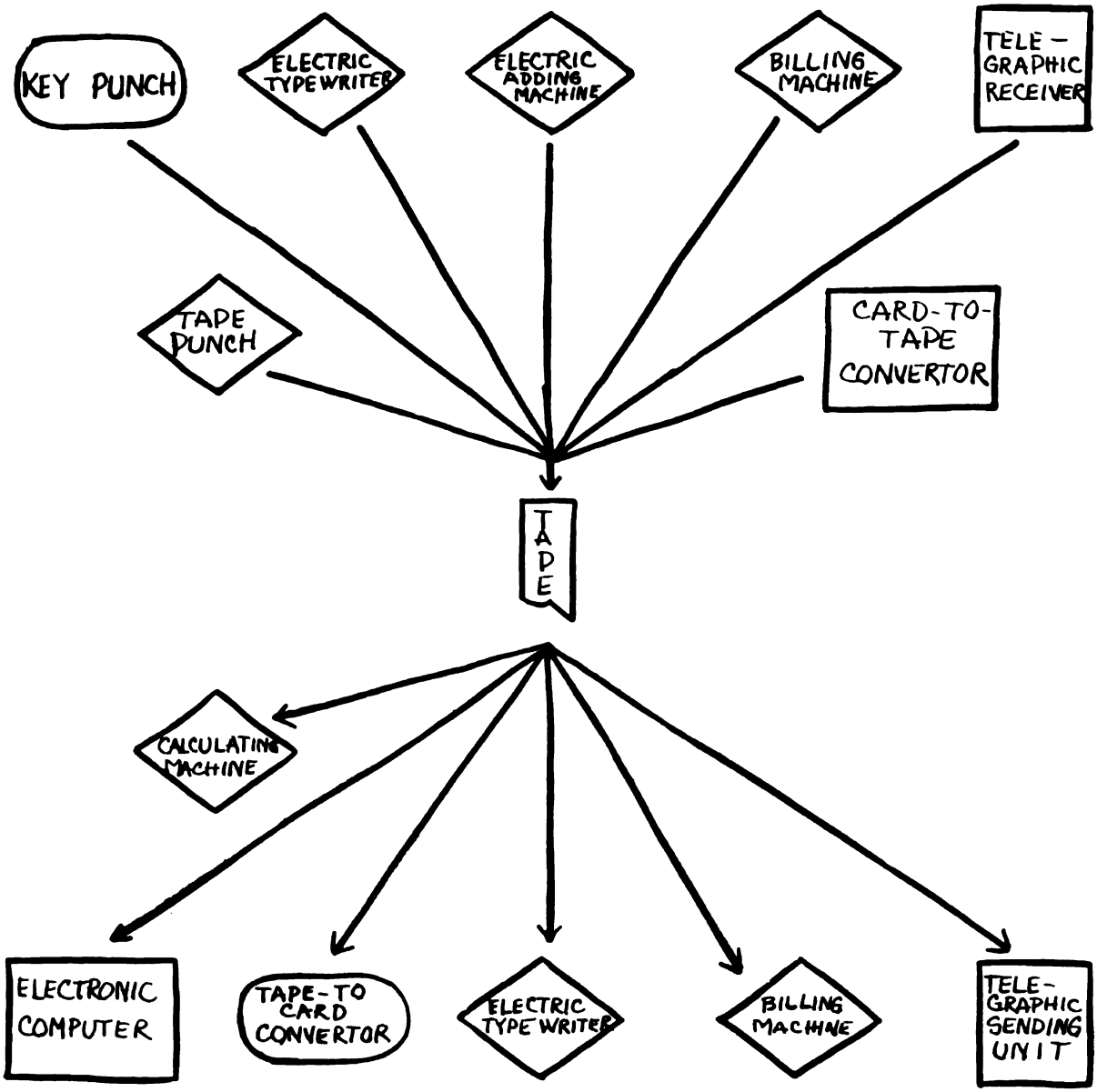


FIGURE 27

CREATION AND USE OF COMMON LANGUAGE FIVE CHANNEL PUNCHED PAPER TAPE

[redacted]

Date Due

Apr 24 5[redacted]			
Jul 30' 58			
Oct 20 '5[redacted]			

Demco-293