THE STORY OF FIGURES

THE COVER

The circles of characters shown on the cover illustrate man's method of recording figures from the earliest Babylonian cuneiforms to our present day numerals.

Beginning with the inner circle shown just below the title, THE STORY OF FIGURES, we have:

Circle 1: Babylonian Cuneiform Numerals.

Circle 2: Egyptian Hieroglyphic Numerals.

Circle 3: Sanskrit Numerals.

Circle 4: Hebrew Letters used for 1 to 9. Common in Hebrew arithmetics from 1300 to 1500 A. D.

Circle 5: Greek Alphabet Numerals.

Circle 6: Mixed early Hindu numeral forms.

Circle 7: Modern Arabic Numerals.

Circle 8: Chinese Forms.

Circle 9: Numerals for 1 to 9—Manuscript of 1077 A. D. in the Vatican.

Circle 10: Manuscript in Erlangen of the eleventh century.

Circle 11: Manuscript of eleventh century at Chartres.

Circle 12: Latin manuscript in Paris at the Bibl. Nationale, Twelfth Century.

Circle 13: Manuscript of the twelfth century in the British Museum.

Circle 14: Manuscript of the twelfth century in Rome.

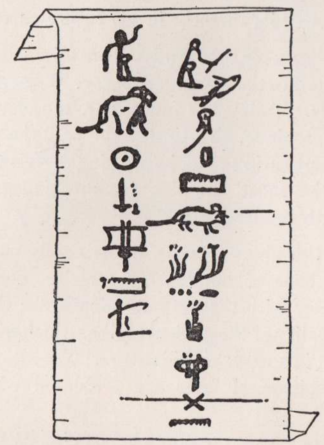
Circle 15: Manuscript of about 1200 A. D. in Paris.

Circle 16: Numerals in two alternate forms from a Latin manuscript about 1300 A. D.

Circle 17: Numerals of the fifteenth century in a Latin manuscript in the Vatican.

Circles 18 and 19: Modern numerals.

The STORY OF FIGURES



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PREFACE

These brief sketches entitled "The Story of Figures" do not pretend to be even a short synopsis of the evolution of figures. They are reminders only that around figures is woven the glamor of romance—that the study of figures is closely linked with the history of civilization. Their effort is to stimulate an interest in a subject too often scorned by the young student as dry and uninteresting—to provoke in him a desire to know more of matters which may concern him directly in his future career.

Man moved slowly for thousands of centuries. He has advanced with headlong speed in the last half century. Yesterday the creaking wagon wheels. Today the motor car, the electric train, the submarine and aeroplane. Yesterday the pen, the pencil and the eraser. Today computing machines which perform, in large part automatically, the most complex bookkeeping problems with accuracy and with rendered proof.

The facts in this short treatise are as nearly exact as circumstances and the haze of controversy permit. Forms of archaic numerals may vary with the authors referred to; they may differ with the individuality of the ancient scribe. Such minor variations are of no moment in a work of this nature. They do not controvert the claim that historical facts are presented with substantial accuracy.

Thanks are due to Dr. Louis Karpinski, professor of mathematics, University of Michigan and author of "The History of Mathematics" for his invaluable aid. Credit is also due to the authors of the many other books of reference consulted, including Fink, Smith, Cunnington, Cajori, Conant and Sullivan.

In prehistoric times Man drew symbols on the walls of caves using a charred stick or clays of different colors. Some of these symbols apparently stood for numbers

Chapter I.

INTRODUCTION OF NUMBERS

When man first began to figure he wrote out words to illustrate his numbers. Then the Greeks devised the plan of having the first letter of the word illustrate the number. Thus D (Δ) comes from the Greek word for ten (deka) from which we get "decimal." The Roman numeral system followed a similar principle.

The Syrians and Hebrews used the twenty-two letters of their alphabet to represent numbers. The Phoenicians had two methods. They either wrote out numbers in words or used vertical marks for units and horizontal marks for tens.

The Arabs abandoned the use of number words in the eighth century and adopted the system used by the Hindus, who shortened their number words down to the first letters. The Western Arabs modified this even further and devised what are known as the Gubar (dust) numerals which are the ancestors of our modern numerals.

Our system of placing our numbers—so that we read 55 as fifty-five, not 5 plus 5—owes its origin to the Hindus.

The Babylonians wrote their numerals with a pointed stick or stylus on soft clay tablets. The marks made by the point of the stylus are like arrowheads or wedges. The numerals thus written are called "cuneiform" numerals from the Latin "cuneus" (a wedge). The mark made by the other end or blunt end of the stylus formed a circle, just as it would if you pressed the wrong end of a pencil into the clay. By pressing with only one side of the blunt end, a crescent was formed. These circles and crescents are called "curvilinear" numerals. When the Babylonians kept accounts they used cuneiform numerals to denote debits and curvilinear numerals to denote credits, somewhat as we use red and black ink in account books today.

—*Karpinski*

Curvilinear numerals on a Sumerian clay tablet more than six thousand years old now in the Harvard Semitic Museum. In the center is the 6; below this is 24 indicated by two circles and four half circles or crescents.

Ahmes, an Egyptian temple scribe, lived nearly 4000 years ago. He wrote the first known handbook on Arithmetic. The Ahmes papyrus (manuscript) still exists in the British Museum

Chapter II.

PRIMITIVE METHODS OF FIGURING

Necessity drove man to figuring. As families grew into tribes and tribes into nations a system of trade sprang up. One tribe or nation might have wonderful clay for making pottery; another might grow herbs for dyestuffs or medicine. They would trade clay for herbs. As nations grew and the volume of trade increased, they felt the need of selling on credit. A nation raising grains or herbs might need clay for pottery, but the harvest might be some time away. So it bought clay, giving its promise to pay in grain when the harvest came in. Written records became necessary; and accounting was born. Coins or tokens were made to represent certain definite values.

The first writing of numerals probably was done by scratching on soft clay with a pointed stick. Clay tablets, inscribed by the Sumerians 5000 years ago, show that these merchants were familiar with bills, receipts, notes, accounts and systems of measures. A Babylonian tablet, deciphered after more than 5000 years, was found to record payments made by draft and by clay check.

In a tomb near the Great Pyramids of Gizeh in Egypt, recent explorers have found very ancient numerals painted on the walls in which 1 is represented by a vertical line, 10 by a kind of horseshoe, 100 by a corkscrew shape, 10,000 by a pointing finger, 100,000 by a frog and 1,000,000 by a man looking astonished.

About 4000 years ago Ahmes the Moon-born, an Egyptian temple scribe wrote a handbook on arithmetic. It is now in the British Museum. Written in ink on papyrus, a paper made from reeds, this book contains examples of linear equations, unit fractions and mensuration. The occasional use of red ink suggests that a teacher corrected the work.

The Egyptians became so accurate in figuring that their architects, who measured the base for the Great Pyramid of Gizeh across a rocky mound they could not see over, completed their work with an error in the sides of only 1/27000 part of a right angle. Once man began to write down figures it was not long before he began to calculate.

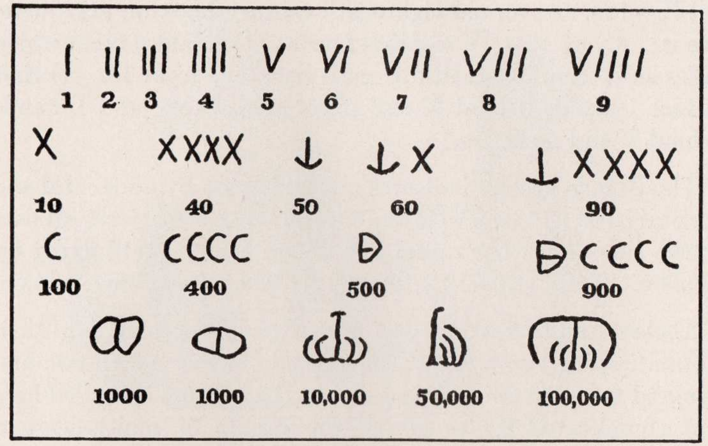
Chapter III.

ADDITION

Primitive man picked up a skin and said, "One skin." He picked up another and said, "Two skins." That was about the limit of his arithmetic. Some, perhaps, counted as high as five and then said, "Five skins and one skin," when they meant six. This was the first addition. The Niues of the Southern Pacific still say "One fruit, two fruits, many fruits." Australian savages can rarely count above two. The Veddahs, or wild men of the Island of Ceylon, have words for only 1 and 2. For any number over two they say "Two and one more, and one more, and one more, and one more, and one more, etc." Addition was the base of all figuring. It still is the only method of computation with primitive tribes all over the world.

As trade grew, systems were devised for larger numbers. The decimal system was one of these. It was the general favorite because it has as its basis the fact that man has ten fingers and ten toes and that he used these in his early counting. Some systems such as the Babylonian had sixty as their basis while the Aztecs used twenty. So the Eskimos and the American Indians of the West Coast today count by twenty, using the sum of their fingers and toes as a basis. In this way large sums can be represented by simple addition.

The Israelites, though rated as unusually intelligent people, confined their counting to low numbers, using addition to denote larger numbers. Thus they spoke of the average life of a man as three score years and ten, because it was easier to count twenty (a score) three times and then add half a score (10) than it was to count up to seventy. This was plain addition.



—*Karpinski*
Ancient forms of Roman numerals with their modern designations

Chapter IV.

SUBTRACTION--MULTIPLICATION DIVISION

Subtraction links itself directly with addition in primitive methods of figuring. Since subtraction is merely taking away something, primitive man even today in subtracting three from five holds up five fingers and then turns down three of them leaving two. This solves the problem quite effectively.

The Roman numeral system, believed to have been inherited from the Etruseans, embraces the principle of subtraction. It uses letters for symbols; for instance, X means 10, C means 100. If a letter is placed before another of greater value, it is subtracted. If it follows the larger one, it is added. IV means $V-I=4$; XC means $C-X=90$; VI means $V+I=6$; CX means

C+X=110. As an old eighteenth century book on arithmetic has it: "Note that IV signifies four as IX signifies nine; which takes as it were by stealth or pulls back one from 10. So that in fact I stands behind X and picks his pockets, and I stands behind V and picks his."

The Roman system indicates multiplication by horizontal and vertical bars. Thus $\overline{\text{XVIII}}$. is $18 \times 1000 = 18{,}000$. Vertical bars at the side and a horizontal bar above denote multiplying by 100,000. Thus $|\overline{\text{X}}| = 10 \times 100{,}000 = 1{,}000{,}000$, or one million.

Ancient multiplication was a matter of repeated addition. In multiplying two by four, the ancients merely added two and two and two and two and got eight. Later they compiled long and complicated tables giving the results of multiplication. These were used extensively.

Division, even in the early times, probably was done by means of repeated subtractions. To divide nine by three the ancients were believed to have subtracted three from nine giving six; then three from six leaving three; and three from three leaving nothing. They found that three goes into nine three times. This method and the addition methods of multiplication are complicated and tedious. While there remain in ancient works no well defined rules for division it is assumed that this is the theory on which arithmetical processes were developed.

—Cunnington

These symbols—supposed to represent pairs of legs walking—were used by ancient Egyptians for plus and minus signs

In the time of the Crusades, money was sometimes carried in the form of gold or silver chains. When a knight wanted to make a purchase he would cut off a piece of chain which the merchant would weigh against actual coins. This practice is still in vogue among the coolies or laborers in Southern India

Chapter V.

FRACTIONS AND DECIMALS

THE word "fraction" is derived from the Latin word "fractum" which means "broken." Ancient man in his trade dealings had little need to resort to fractions. When ancient peoples encountered difficulties in handling parts of a broken object they created various measuring systems for designating sub-units. Our word "inch" is a relic of the Roman system. The Romans clung to 12 as a basis of their division of measures because it is easily divisible by 2, 3, 4 and 6. This permitted the taking of simple fractional parts. They divided the foot into twelfths, each twelfth being called an "uncia" whence comes our "inch." They also used the same fractional part "uncia" for the twelfth of pound whence we get our word "ounce." Counting commercially by twelfths, their "duodecim" meaning twelve, gives us our "dozen."

Every system of counting has its radix or base. Ten was the one most often used and formed the basis of the decimal system through the primitive method of counting by tens from the ten fingers and ten toes. The Babylonian system, as has been noted before used sixty as the radix. From this we get our minutes and seconds both in time and angles.

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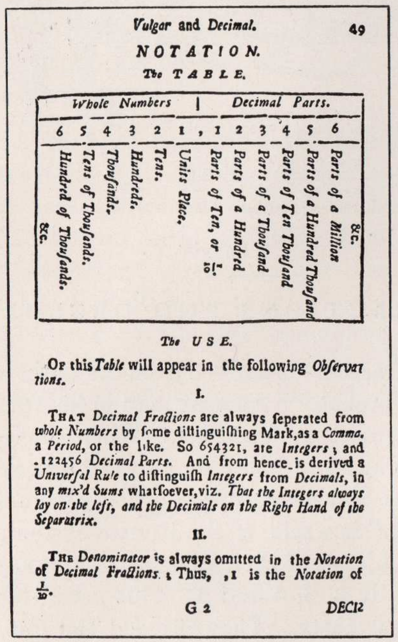


Vulgar and *Decimal.* 49

NOTATION.

The TABLE.

	Whole Numbers							Decimal Parts.						
	6	5	4	3	2	1	,	1	2	3	4	5	6	
&c.	Hundred of Thouſands.	Tens of Thouſands.	Thouſands.	Hundreds.	Tens.	Units Place.		Parts of Ten, or 1/10.	Parts of a Hundred	Parts of a Thouſand	Parts of Ten Thouſand	Parts of a Hundred Thouſand	Parts of a Million	&c.

The USE.

Of this *Table* will appear in the following *Obſervations.*

I.

That *Decimal Fractions* are always ſeperated from *whole Numbers* by ſome diſtinguiſhing Mark, as a *Comma,* a *Period,* or the like. So 654321, are *Integers*; and .122456 *Decimal Parts.* And from hence is derived a *Univerſal Rule* to diſtinguiſh *Integers* from *Decimals,* in any *mix'd Sums* whatſoever, viz. *That the Integers always lay on the left, and the Decimals on the Right Hand of the Separatrix.*

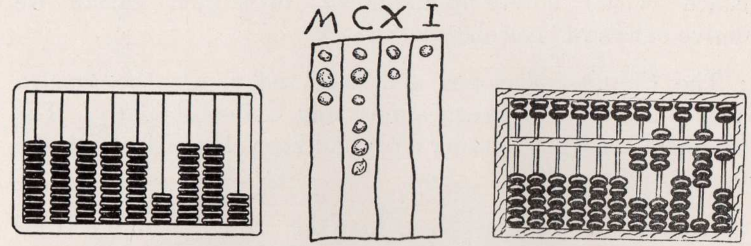
II.

The *Denominator* is always omitted in the *Notation* of *Decimal Fractions*; Thus, ,1 is the *Notation* of $\frac{1}{10}$.

G 2 DECI2

—*Karpinski*

Decimal fractions as presented by an American teacher, Isaac Greenwood, in his "Arithmetick Vulgar and Decimal" of 1729



—*Karpinski*

On the left is a Russian abacus of a form used in that country today. In the center is illustrated the principle of the Roman abacus. Lines drawn or cut on sand or tablets separated the units, tens, hundreds and thousands; small stones were used as markers. On the right is a Chinese abacus or swampan similar to those used in the Orient today

Chapter VI.

BIRTH OF MECHANICAL FIGURING

Ages ago man's inventive genius turned to ways and means of saving head work in the tedious process of figuring. The ancient Arabs and Romans were just as eager to find ways of saving time and labor as are our inventors today.

As trading and shopkeeping grew more and more complicated some lazy genius invented a way to avoid keeping figures in his head or having to scratch them on tablets of clay. He invented a board, covered with dust, on which he could trace figures, draw columns and work with pebbles. Perhaps he was a Greek, as this dust board was called the abacus, from the Greek word "abak" (pronounced abacue) meaning "dust." The blackboard of the modern schoolroom possibly is derived from the old primitive dust board.

The early Greek bankers and the early Romans made an abacus of stone provided with grooves in which small stones called "calculi" moved up and down. From their "calculi" we derive our word "calculate."

The Chinese developed and even today, use the wooden abacus as you may see in almost any Chinese laundry. The proprietor does his figuring on it and keeps his books with the familiar ink brush.

Even earlier than the abacus were the "sangi" or number rods still used for computing by the Koreans and Japanese.

These rods, though not used in the same way, are a reminder of the tally system in vogue in England from the time of William the Conqueror to as late as Charles II. When a man owed money he would record the amount by cutting notches in a stick called a tally stock. He would give the stick to his creditors.

Sometimes dishonest creditors would cut extra notches before they presented the tally stock for payment. So the system was changed. After the notches were made the tally was split down the middle. The notches on the creditor's half then had to correspond to the notches on the debtor's half. Hence the verb "to tally" and its use in such examples as: "His figures don't tally" and "Your idea tallies with mine."

Banks kept records of deposits by the tally system. Their depositors held tally stocks corresponding to those in the bank. From this came the modern word "stockholder."

Up to 1543, the British Government also kept records of transactions by the tally system. After the system ceased, the basement of the House of Commons remained cluttered with vast accumulations of these dry sticks for nearly two centuries. Finally it was decided to burn them. The stove became overheated and a fire ensued which burned down both the House of Commons and the adjacent House of Lords.

Chapter VII.

BLAISE PASCAL'S ADDING MACHINE

Blaise Pascal, born in Clermont-Ferrand, France, in 1623, was a mathematical wizard. When other youngsters were amusing themselves at play, he would be off in a corner working out a complicated problem in mathematics. Before he was out of short pants, he created many theorems identical with those to be found in the first book of Euclid. He did this entirely out of his own head without any reference to books.

His mind early turned to devising a machine which would do problems in addition. At 19 he invented and built a computing machine that served as a starting point for every later development in mechanical calculation. This calculating machine gave results by the simple turning of a handle. He presented a model to the King and another to the Royal Chancellor. However, in those days when each part had to be forged and finished by hand his cumbersome and elaborate machine was too expensive for common use.

Regardless of this, Pascal laid the foundation for adding machines. When you look at the automatic counter on a printing press, the cyclometer on a bicycle, the speedometer on your automobile or the fare register in a street car, it should remind you of Pascal. All these calculators are adapted from the principle of Pascal's machine.

—*Smith*

Blaise Pascal
After a contemporary drawing

Sir Samuel Morland presents his machine for adding and subtracting and a machine for multiplying to King Charles II of England

Chapter VIII.

MORLAND'S MACHINE

Another attempt at making a machine to save man the work of figuring was made during the reign of Charles II in England. Samuel Morland was the inventive genius this time and he made two different machines which he presented to his sovereign. One of them he called "a new and most useful instrument for addition and subtraction of pounds, shillings, pence and farthings without charging the memory, disturbing the mind or exposing the operator to any uncertainty, which no method heretofore published can justly pretent to." The other machine he called "machina nova cyclologica por multiplicatione" or "a new multiplying instrument."

The adding and subtracting machine was operated by turning wheels with a stylus or stick pointed like a pencil. This was inserted into holes punched under the numbers engraved on the margin.

But despite Morland's claims of not "charging the memory" neither of the machines had any mechanism to handle the "carry forward." If the operator added up a row of figures and the total came to 75, then the 7 had to be remembered and added into the tens column by the operator.

Sir Samuel Morland
After a drawing in the Pepys collection

Charles Babbage was an eccentric. He invented water skates and nearly drowned himself. He once had himself baked in an oven to try the effect on his temperature; and tried to call up the Devil by repeating the Lord's prayer backwards

Chapter IX.

BABBAGE'S FOLLY

A century elapsed before the next attempt to make an adding machine. Then Charles Babbage, Esq., M. A., as he called himself, nearly broke his heart trying to complete his "engine of differences" to be used mainly in astronomy and navigation. His machine was different from its predecessors, in that it was designed to *stamp a record of its work on plates of copper or other suitable material.*

Babbage is entitled to lasting fame because he was the first to think of a device that fulfilled the prime condition of performing its calculation and recording the result without the possibility of any human error creeping in.

Granted £17,000 (approximately $85,000) by the government to build his calculating machine, he worked on it for ten years.

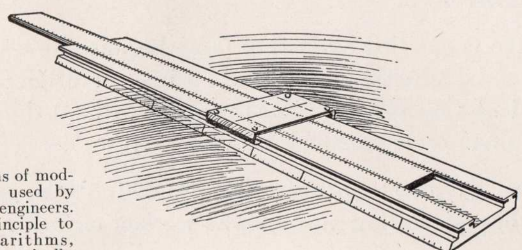
When it was only half made he had used up this grant and a large part of his own fortune.

Babbage died poor with only a ponderous mass of complex mechanism as large as a barrel to show for his work. When the government offered him this half finished machine as a recompense, he scornfully refused it. It was accepted, however, by King's College and now lies in King's Museum.

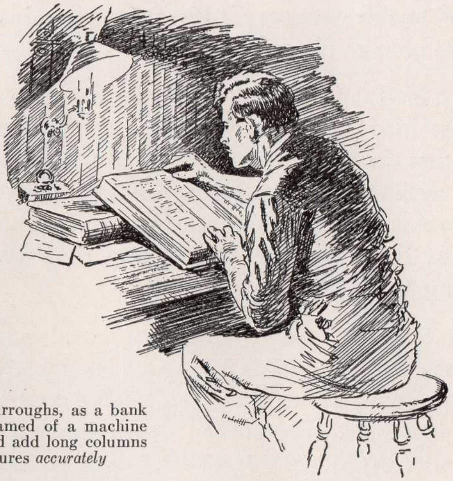
Following Babbage, dozens of inventors, cranks and enthusiasts tried their hands at a computing machine. Most noteworthy of these in historic interest was Thomas de Colmar, an Alsatian, who built a machine in 1850. His machine was operated by gear wheels and pinions actuated by a crank. It was the inspiration for many of the machines used by statisticians and craftsmen today.

Passing mention should be made of John Napier, a clever Scot, who in the seventeenth century tried to simplify computation by the use of rods, square prisms marked with the multiplications from 0 to 9. These rods were sometimes made of bone and so the contrivance was called Napier's Bones. The usefulness of the rods was very limited.

In 1614 Napier, still trying to simplify computations, published his epochal work on logarithms which absolutely revolutionized computation processes.



One of the forms of modern slide rules used by architects and engineers. It owes its principle to Napier's Logarithms, indicated geometrically



Young Burroughs, as a bank clerk, dreamed of a machine that would add long columns of figures *accurately*

Chapter X.

THE DRAMATIC STORY OF WILLIAM SEWARD BURROUGHS

Babbage built his "engine of differences" for the navigator and astronomer. Yet, no one had given a thought to the poor work-ridden bookkeeper, hunched over his ledgers.

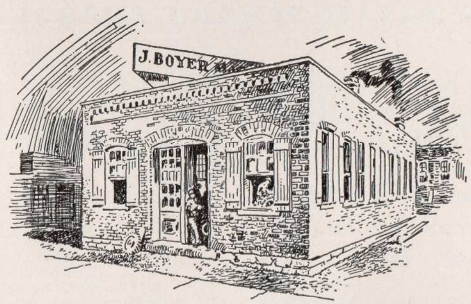
It remained for William Seward Burroughs, himself a bookkeeper, to invent and build the first practical adding machine for commercial use. His story is a dramatic one.

Born in Rochester, N. Y., Jan. 28, 1857, of humble parentage, he acquired his sole schooling in the elementary schools. When 20, he entered a bank in Auburn, N. Y. Analyzing his work, he found that about half his time was taken in trying to guard against error, half, of the remaining half in hunting for errors made.

Burroughs' health gave way. Physicians said his only chance to live was to change his occupation.

He went to St. Louis and got work in a machine shop. Often he worked far into the night conceiving a machine that would record amounts on paper, that would add these amounts just as recorded, without the slightest possibility of error, and would carry a progressive total just as fast as the amounts were listed, so that on pressing a key at any time a correct total would be printed *instantly*.

"Accuracy is truth filed to a sharp point," was Burroughs' motto. No ordinary materials were good enough. His drawings were made on metal plates that could not stretch or shrink by the fraction of a hair. He worked with hardened tools ground to a point and when he struck a center or drew a line he did it under a microscope. His drawings, even judged by the precision standards of today, are a marvel of accuracy.



Joseph Boyer's machine shop in St. Louis, where Burroughs made his first adding machines

Joseph Boyer listens while Burroughs outlines his ideas for an adding machine

Chapter XI.

THE DREAM IS REALIZED

One day Burroughs was sent to repair some mechanism in a St. Louis dry goods house. His skill attracted a member of the firm, who learned of his ambition. This man interested others and obtained $700, for which Burroughs gave them 14 shares of stock in the company he proposed to organize. Other money came in and Burroughs got room in the machine shop of Joseph Boyer in St. Louis, which did considerable experimental work for inventors.

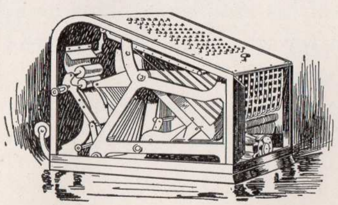
Every dollar that Burroughs could scrape together went into his invention. He exhibited his first machine publicly in 1884. It formed the basis of his fundamental patent issued in 1888. It was the first ever granted for a key-set recording and adding machine. The keyboard and adding mechanism remain practically unchanged in the Burroughs machine today.

The basic principle of Burroughs' machine was the pivot. Leading mechanical engineers still declare this principle to be the soundest ever adopted for the purpose.

Burroughs built with the idea that his machine must be as independent as possible of the human agency. He evidently had in mind the typist with her too-busy eraser, and decided at the start to do away with errors caused by accidentally striking the wrong keys.

One safeguard he threw around his work was the "locked keyboard," a most ingenious idea which guarded against possibility of the operator accidentally striking a wrong key after setting up the amount. This locked keyboard also made it possible for the operator to read the amount set up on the keyboard before printing it.

In January 1886, the American Arithmometer Company was organized in St. Louis, and the world-old dream of an adding machine was at last a commercial actuality, although it was several years before it became a readily marketable commodity.



The first machine built by Burroughs

William Seward Burroughs

Chapter XII.

AT LAST THE SUNSET OF A TEDIOUS DAY

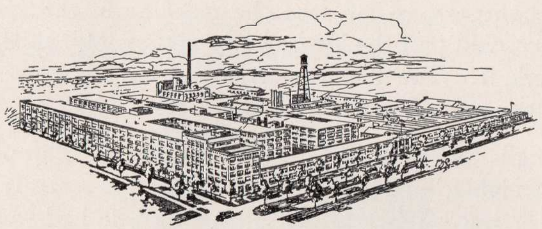
In one sense Burroughs machines were perfect. They performed excellently when Burroughs operated them himself, but when operated by others the results varied. The difficulty was that no two persons operated the machine in the same way. One man would pull the lever slowly and evenly while another would jerk it. The two results would be far apart. There were bitter complaints from his associates.

Burroughs locked himself in his workshop. Through three days and nights, he worked unceasingly, with scarcely a pause for food or rest. When at last he emerged he had worked out a practical mechanism which caused his machine to function uniformly regardless of the inexperience, carelessness or violence of the operator.

This device, which is now famous as the "Burroughs Automatic Control," was applied to the machine and found perfect. Success followed right on the heels of failure. Burroughs dashed the original fifty machines, which had proved failures, out of the window.

The problem of the company now rested largely in marketing the machines to a skeptical public. Many men scoffed at this "trick mechanism"; few realized that this machine might work wonders in their offices. It took years to convince the general public of the machine's commercial value. In the meantime, the machines were sold largely to banks.

By 1895 the business had grown to a point which justified moving to a new site in the St. Louis business district. Here the "registering accountant," as it was called, grew into a semblance of the wonderful Burroughs Adding and Listing Machine as it is today. The company outgrew these quarters and in 1904 moved the entire plant to Detroit, where it laid the foundation for the handsome Burroughs factory. This today is one of the model industrial plants of this country and the largest factory in the world devoted to the manufacture of figuring equipment.



The present factory of the Burroughs Adding Machine Company, Detroit, Michigan. It is the largest factory in the world devoted exclusively to the manufacture of figuring equipment

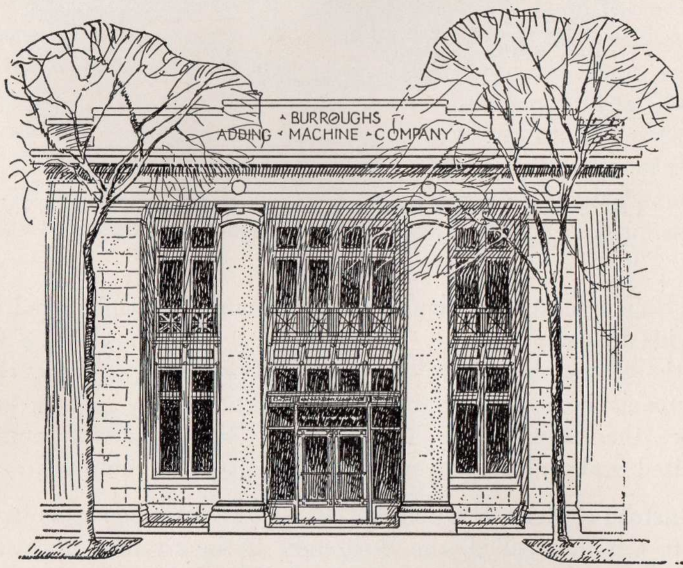
Chapter XIII.

"IF YOU WOULD SEE HIS MONUMENT LOOK AROUND"

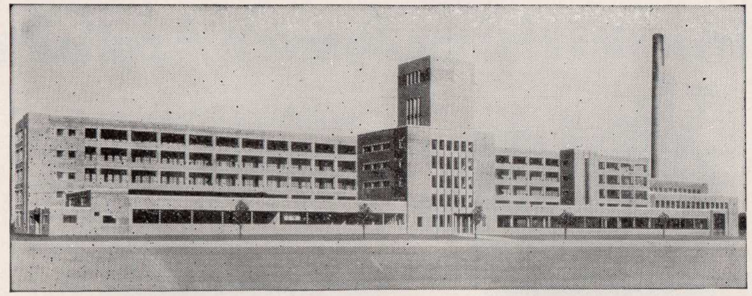
UNLIKE most inventors, William Seward Burroughs lived to see his dreams come true. Burroughs' first backer invested $700 in the genius of a poor, young, and sick mechanic. Today the company he founded is internationally famous. There are more than 572 Burroughs offices and service points in the United States alone, and many others in foreign countries.

Instead of a simple adding machine, or registering accountant as it was first called, the Burroughs Company now makes a long line of adding, bookkeeping, calculating, statistical, billing and cash registering machines, some so uncanny in their automatic performance that it seems as if they had a spirit inside to guide their movements. To this line of machines have been added ribbons, roll papers, carbon papers, and other supplies.

But at last Burroughs had to give in to the illness which he had been fighting all these years. Retiring, he made his final home in the mild climate of Citronelle, Alabama. He died September 14, 1898; and was buried in beautiful Bellefontaine Cemetery, St. Louis. A tall marble shaft erected by his associates marks the spot where he rests, serene at last, after the struggles and privations of a life that was hard beyond the ordinary. His service to clerks and bookkeepers like himself, and to businessmen, will last forever.



The main entrance to the Burroughs Factory and main offices. There are more than 572 Burroughs offices and service points in the United States alone. Burroughs machines are sold and serviced in every civilized country



New Burroughs Factory Branch at Plymouth, Michigan

There's a Burroughs Machine for Every Business Need

Some idea as to how completely Burroughs machines meet the figuring, accounting and cash registering requirements of modern business can be gained from the following pages.

For figuring and accounting, for example, the long line of Burroughs machines makes it possible for Burroughs to recommend and install in each instance the particular style and size of machine that will do the work most efficiently, save the most time and give the greatest return for the investment.

For cash registering requirements, Burroughs builds two types of machines—a machine for cash registering only, and a machine that serves *both* as a cash register and as a standard adding machine.

Back of every Burroughs machine sold is a half century of experience in simplifying the needs of business. Burroughs invites you to make use of this experience.

Machines for the Simplest Applications

Accounting Machines

For all commercial and bank accounting work requiring typewritten description. Posts any combination of related records in one operation. Wide selection including machines that accumulate a large number of totals, and the new Burroughs Statistical Tabulating Machine with column selection.

Calculators

With or without electric operation. The style illustrated accumulates group totals and a grand total. Amounts may be subtracted from grand total at the touch of a key. Soft-tone, non-reflecting case and keyboard. Other styles are available with six-, ten-, or fourteen-column capacity.

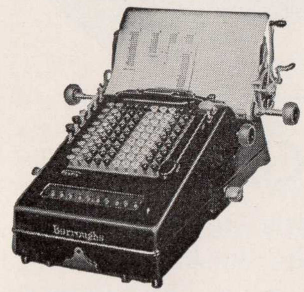
Desk Adding Machines In a Wide Range

Adding, duplex adding, adding-subtracting, bookkeeping machines. Eight-, ten- and thirteen-column capacities. Wide or narrow carriages. Hand or electric operation, plus and minus motor bars and credit balance feature. Short-cut keyboard.

and the Most Specialized Requirements

Computing Billing Machines

The only machine that writes and computes a complete invoice in one operation including all typing, extending, discounting, and totaling of the bill. Extensions computed by direct multiplication. Extensions and totals printed by the depression of a single key.



Visible Duplex Adding Machines

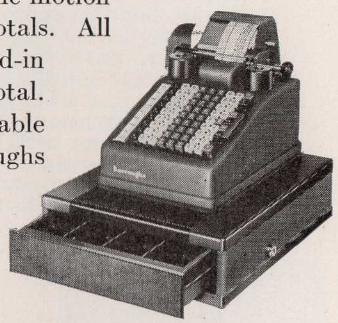
Burroughs duplex adding and listing machines provide separate net totals of any number of groups of figures and a grand total of all without relisting. Made in a wide variety of styles and capacities for commercial and bank use.

Accounting Machines

Burroughs Multiple Register Accounting Machine in styles for commercial and bank use. Equipped with front feed carriage. Posts several related records in one operation, provides full-width journal and establishes proofs.

Burroughs Cash Machine

A DISTINCT advance in registering and safeguarding transactions. Issues itemized receipts which show amount of item, total of sale, tax, and number of items purchased. Entire amounts may be registered with one motion of the hand. Fast, single-stroke totals. All transactions recorded on a locked-in detail tape. Locked-in grand total. Automatic cash drawer with removable plastic till. Other styles of Burroughs Cash Registering Machines provide supervision and control over Cash, Charge, Received on Account and Paid Out transactions.



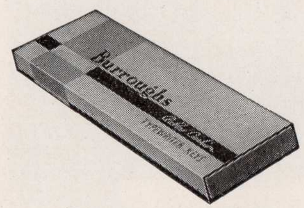
Burroughs Chair

THE new Burroughs Chair, available with or without arm rests, offers unique advantages of design, durability, safety and comfort. Base, seat and back frame are one-piece aluminum castings. Swivel and casters are self-lubricating and noiseless. The wide-spread base is equipped with stainless steel scuff plates. Upholstered in foam rubber and durable plastic-treated fabric. Five easy adjustments insure effortless correct posture: (1) height of seat (2) angle of back frame (3) angle of back rest (4) height of back rest (5) tension of back spring.

Business Machine Supplies

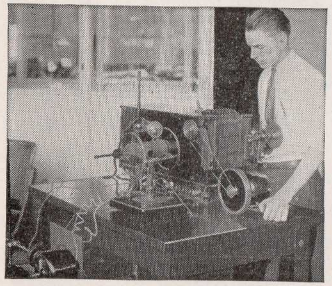
A COMPLETE line of supplies is offered to users of business machines as an important Burroughs service. All supplies are guaranteed, and are sold direct to users from Burroughs factories at Detroit, Michigan, and Windsor, Canada, as well as from all Burroughs branch offices.

BURROUGHS supplies include carbon paper for all commercial requirements, in various grades, weights, finishes, colors and sizes; roll paper, journal sheets, journal rolls, ribbons, cash register rolls, cushion keytops, machine hoods and aprons, and other items. A complete list, with prices, will be sent on request.



BURROUGHS supplies may be conveniently purchased through any of several plans designed to meet the requirements of various types of users. Substantial discounts are offered for quantity purchases. Deliveries can be arranged as supplies are needed, insuring fresh, clean supplies at all times, at minimum prices.

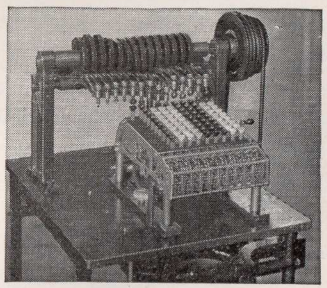
You Can Rely on the Quality of Burroughs Construction



Uncompromising accuracy! This marvelous testing machine shows visually and photographically the noise, vibration and other characteristics of an electric motor

Burroughs Machines are the product of a half century's experience in precision manufacture. Burroughs is the world's largest manufacturer of figuring equipment. The Burroughs factory is therefore equipped, and the Burroughs craftsmen are trained, for precision work. Precision manufacture insures long life, smoothness of operation, and freedom of mechanical troubles.

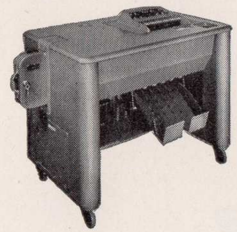
A corps of inspectors, specially trained, constantly checks the accuracy of Burroughs manufacture. Each part is tested separately. The slightest deviation from perfection disqualifies any part. As the parts are assembled into sections, each section is tested repeatedly. When the various sections have successfully passed the tests and are assembled, the complete machine passes through exacting tests for adjustments. And finally it must pass the commercial inspection where it is made to perform repeatedly every operation that could possibly be demanded of it if it were in actual use.



Mechanical fingers operating the keys of a Burroughs Calculator, far beyond the speed possible with human fingers, test it for mechanical perfection and durability

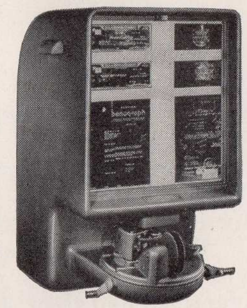
Burroughs Microfilming

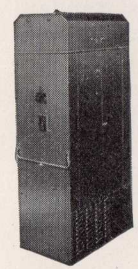
The microfilming equipment offered by Burroughs represents the best in modern methods of copying, storing and preserving business records. These products, manufactured by Bell & Howell, are backed by forty years' research and experience in manufacturing precision motion picture equipment.



A new principle reduces cost of microfilming. The easy-to-operate Recorder photographs both sides of a document simultaneously, placing more images on a single roll of film than is possible with any other method.

With the Reader, images may be turned in any direction; 8mm images on both halves of 16mm film can be read at the same time. Facsimile prints, to *actual size*, can be made in a few minutes without a darkroom.





Burroughs processing centers render prompt, efficient service in developing exposed rolls of microfilm. Many large volume users, however, prefer to develop their films on their own premises. These users find the Automatic Processor simple and easy to use. A roll of film may be processed, dried and spooled, automatically, in a matter of minutes.

Burroughs Service

From over 570 service points throughout the United States, Burroughs furnishes complete and efficient mechanical service for Burroughs products.

Burroughs servicemen are factory trained and factory supervised. They carry credential cards by which they may be identified and their work is guaranteed by the Company.

In accordance with the terms of the Company's standard guaranty, mechanical service is rendered to Burroughs machines without charge. This service includes (1) Periodic, systematic mechanical inspections; (2) Extra mechanical service as requested; (3) Installation of genuine replacement parts, manufactured by Burroughs.

Similar service may be continued after the guaranty period, through the economical Burroughs Service Agreement plan. Mechanical service is also available on a labor and expense basis.

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Burroughs