Computers

Transformation of counting inventions towards wonderland Internet

A demonstration of the full history of the computer and how a chain of counting inventions, social and technical evolution resulted into the fascinating wonderland Internet of today…

Painted artwork by Said Abdel Aziz (Egypt - 20.04.1996)

50 years Egyptian society of accountants and auditors

Photo proof

intensive red

orange screen

normal print

weak colors

Font usages: Titles - **Arial 12pt** / Arial 10pt
Postal description - *Arial 9pt*
Thematic story - Arial 10pt
Thematic description - Comic Sans MS 9pt

1

What's the history of the 'great invention'?

1.1 The earliest counting tools.

Counting on fingers

As long as there have been numbers, mankind has suffered and struggled with counting, also when we were young. So, it is no surprise that he has searched for tools. The starting point was counting on fingers and basic material found in nature around them.

Inca quipu keeper

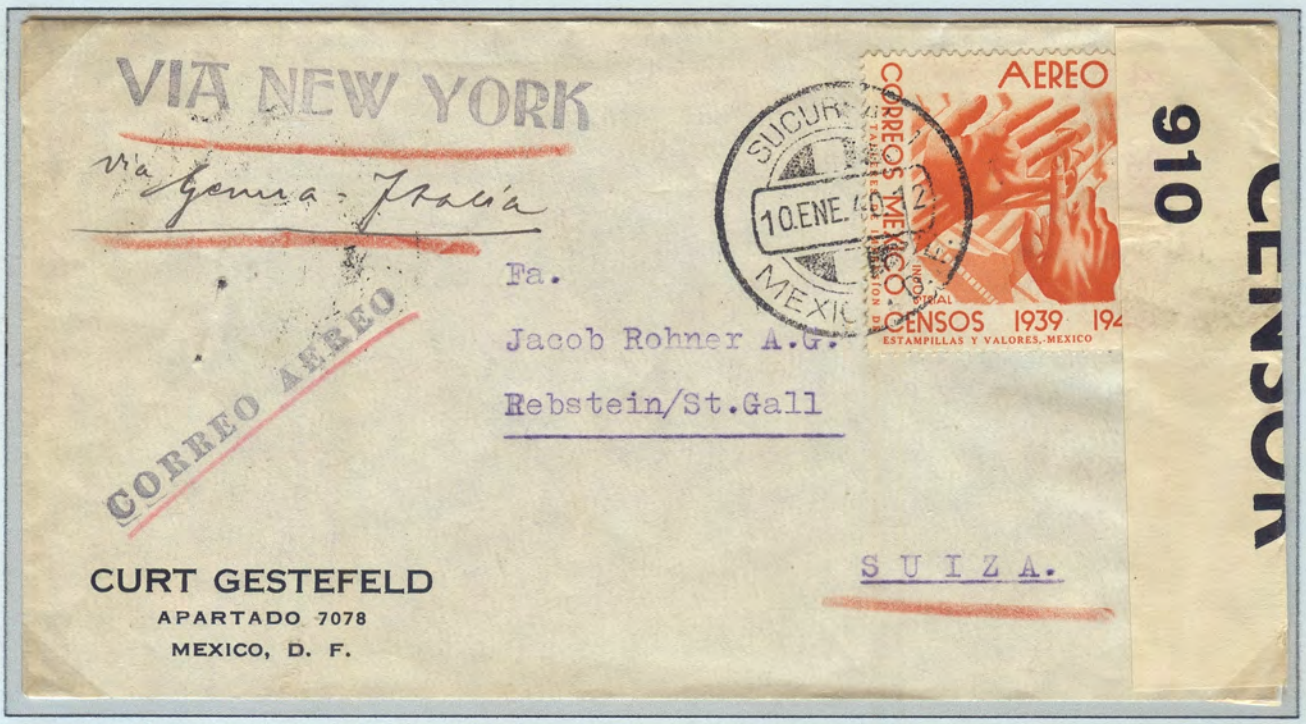
Paintings found in caves have been variously interpreted as counting methods, calendar records, lunar variations or depiction of life.

◄ ▼*proof*

Scribes noting down counts (fragment Theban tomb no.69)

The hieroglyphic system was only suitable for memorial inscriptions on stone monuments.

Other tools like knots in strings, **quipu**, noting on boards or bones are calculating tools used primarily in the ancient time for performing arithmetic processes.



American Censored letter (10 JAN 1940) from Mexico to Switzerland via New York (US) and Genoa (Italy); counting on fingers (the number of stages this letter has done from Mexico to Switzerland; 4 stages)

Stationery (Mexico) finger-counting among Aztecs. Detail of mural by Diego Rivera. (National Museum of Mexico)

Tallying the chimes

Counting on fingers is very temporary or isn't always sufficient when bigger numbers. Over the years more tools like keeping a tally, or calculating tables became common and are even today primary calculating tools.

European table abacus (14th century) variant

Many traders and lords all had their calculating tables showing their importance, wealth and social standing.

The tally of 6 Brabant Sols (pennies) marked on letter from Ostend to Antwerp in 1694; a very usual notation at that time.

Antikythera Mechanism

The **Antikythera Mechanism** was an ancient calculator, which revealed to its owner his position and the position of the Sun, Moon, or other known planets, after entering a date via a crank.

Probably the oldest calculating aid with longest tradition has to be found in the Chinese and Japanese tradition.

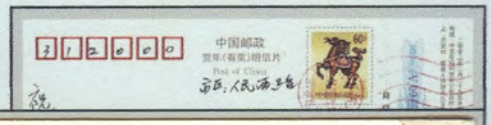
Old Japanese abacus

Because of its long history, the so called abacus is found in many shapes; like boards, metal rods with wooden beads.

Suan-pan

Soroban

The difference between a Japanese **Soroban** and the Chinese **Suan-pan** is the form and the number of beads above and below the wooden partition. The Suan-pan has 2 upper beads and 5 beads below.



Still today many Chinese people carry out every kind of calculation using the abacus (suan-pan) despite having access to electronic calculators; its use is so deeply ingrained in their culture.

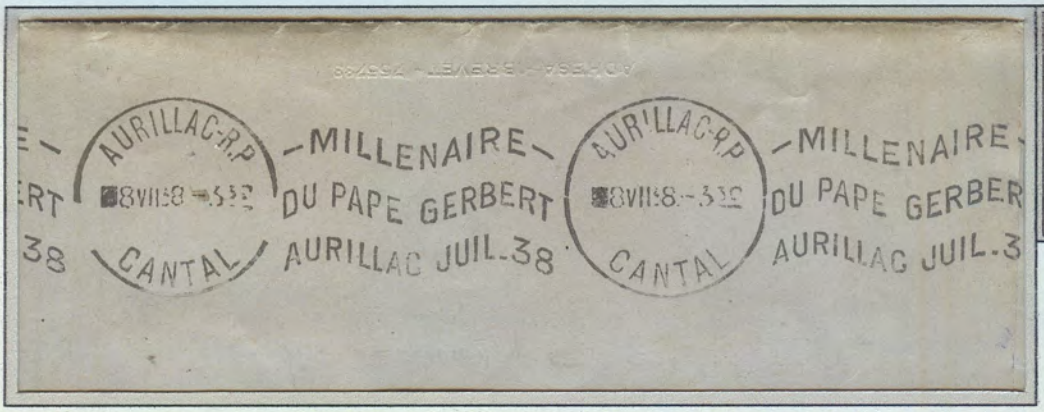
Common abacus, different shapes

A French mathematician, being a French lieutenant in the Army of Napoleon, imported the Russian abacus into our region.

School abacus

Many different shapes, but mostly a vertical frame with horizontal straight wires, found their way in pre-schools and elementary schools, used as an aid in teaching of the numeral system and arithmetic, or why not as a playing tool.

Stationery printed to order (Bayern - 1898)
Abacus as school attribute



Reception cancel Flamme KRAG (France) 8.8.1938 text: Pope Gerbert millennium

Front letter

Pope Silvester II (938-1003), known as monk Gerbert, gave the abacus back the needed attention in combination the 9 Arabic numbers, a lot used in Spain at that time.

colour proofs

The Russian abacus is the grandfather of all the models we know and are used to from school time.

bookkeeper using an stchoty (abacus) calculating the laborers pay bill (N. Verkhotouroff)

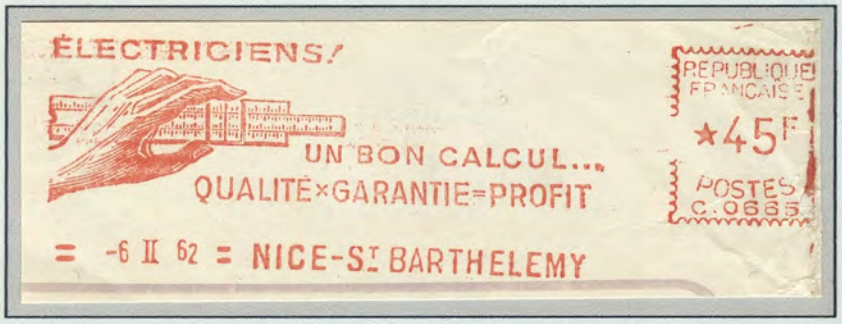
◄ *Stationery - Russia (1929)*

The Russian abacus named **Stchoty,** recognized by the 10 beads on each rod, of which two (the fifth and sixth) are usually of a different colour, which makes it easier for the eye to recognize the numbers from 1 to 10, and two times four white beads, was model for the abacuses we know.

The Scottish mathematician, John Napier (1550-1617) introduced the concepts of logarithms and a simple way to perform multiplication. The Napier 'rods' is one of the earliest attempts of using a new calculator.

John Napier (photo nr 26) created logarithms

Prestige Booklet page ►
(Scotland, Great Britain)



Napier's logarithms resulted in the inventions of the slide rule in 1633. The real breakthrough in its modern form was in 1859. This device appeared in a linear or circular form enables scientists to do calculations quicker.

Postgiro-envelope (France - 1931)

bottom left; circular slide rule

End 1970's it became obsolete by handheld calculators having taken over all of its functions.

Leonardo Da Vinci (1452-1519) made drawings of calculators, but never made a prototype of the calculators he published in his book; the "Codex Madrid I".
Those drawings showed 13 registering wheels and how to propagate a carry to the next digit wheel.

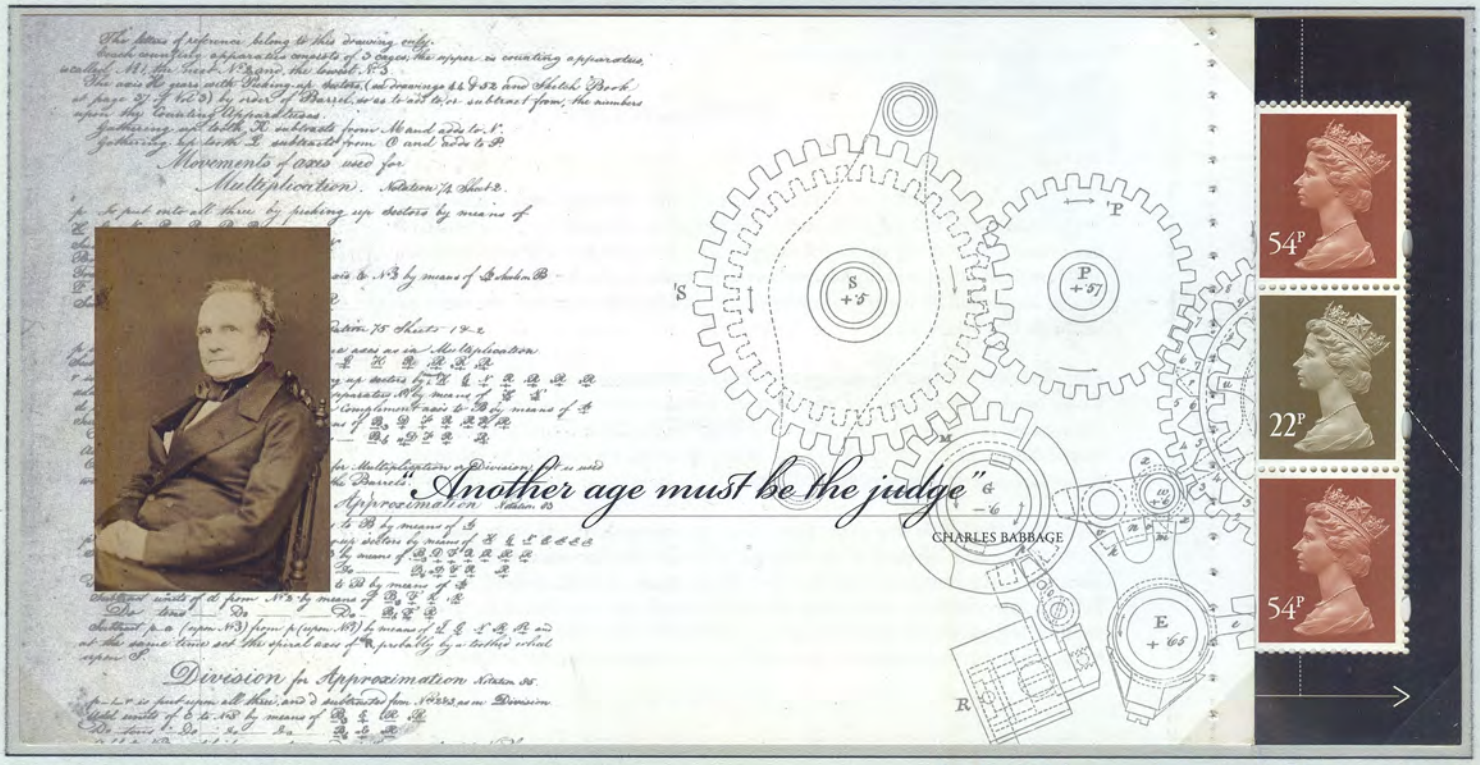
Schickard's machine set to show number 100722 multiplied by 4.

The very first mechanical calculator was built by **Wilhelm Schickard** (1592-1635), professor mathematics and astronomy in Tobingen, was based on the bones of Napier.

Letter Ballon Monté ***'Le Kepler'*** *to London port 30c (**Paris - 10 JANV71** – Paris a Rennes 12JANV71 – London 14JAN71) on flown 11JAN1871; named after famous astronomer Kepler.*

Johannes Kepler

A copy for the famous astronomer **Johannes Kepler** (1571-1630) got lost in a fire. It would have help in Kepler's laborious task of calculating astronomical tables.



Prestige Booklet page (Great Brittain) 'The Royal Society'

Charles Babbage with design 'Difference Engine'

Mathematician **Charles Babbage** (1791-1871) designed 2 models of its "Difference Engine" from 1823 till 1849, an advanced calculator using a large number of gears. He never finished one due to thousands of parts he needed.

Blaise Pascal (1623-1662), born in Clermont, designed and constructed in 1642 the 'Pascaline' at age of 19.

Pascal put several machines into production, but it wasn't successful venture, only fifty got sold. However, this did result in 8 survived to the present day.

Registered at Tours Blaise Pascal ►

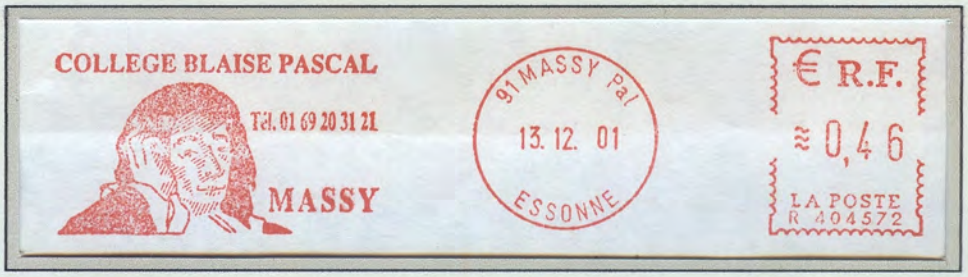
Proof by P.Munier

Misperforation

Pascal received a patent on the arithmetical machine from Louis XIV.

Early usage of cancel dated 11APR1865 bureau (star 29) Rue Pascal, named after Blaise Pascal. Bureau started 1865 till April 1873.

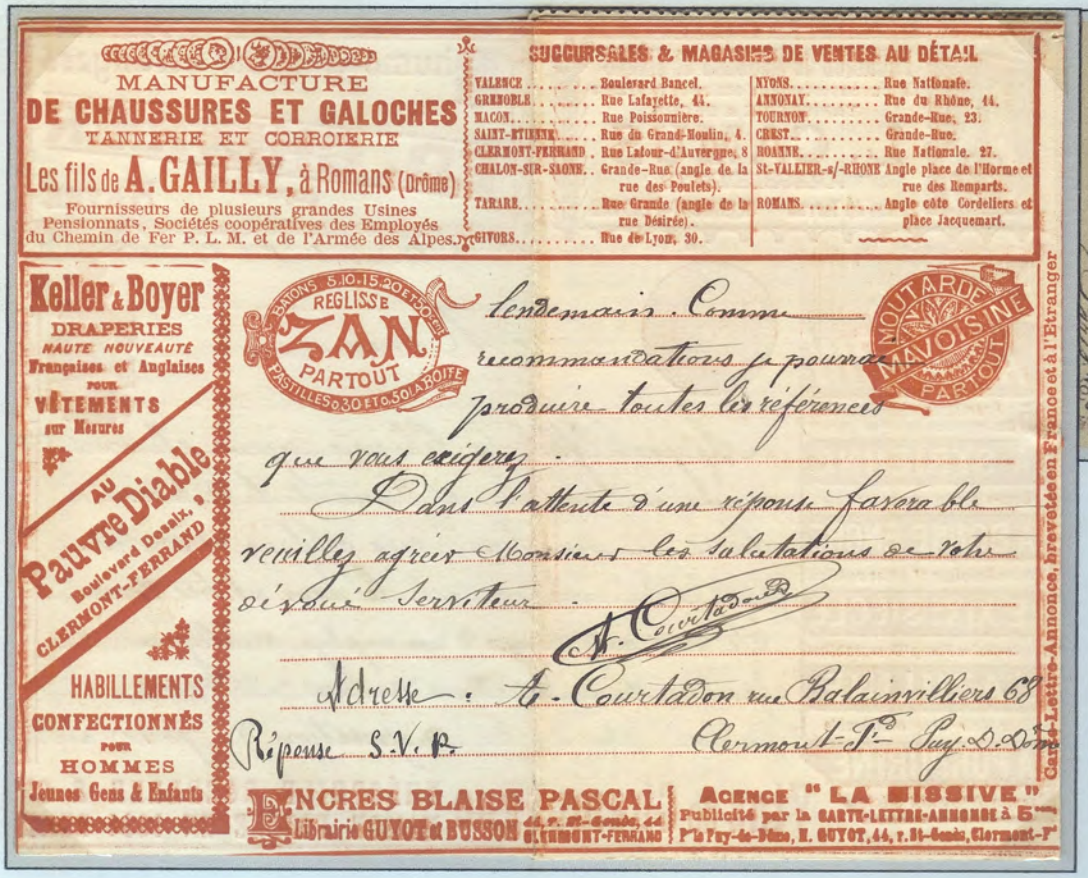
Pascal's portrait wrongly depicts priest Louis Isac Lemeister de Sacy.



Detail stamp: among other scientific studies Pascaline gear wheel

The 'Pascaline' carry mechanism didn't function perfectly. The device came in both decimal and non-decimal varieties.

Die Proof, signed by engraver Mazelin, with embossed stamp "contrôlé". ▶



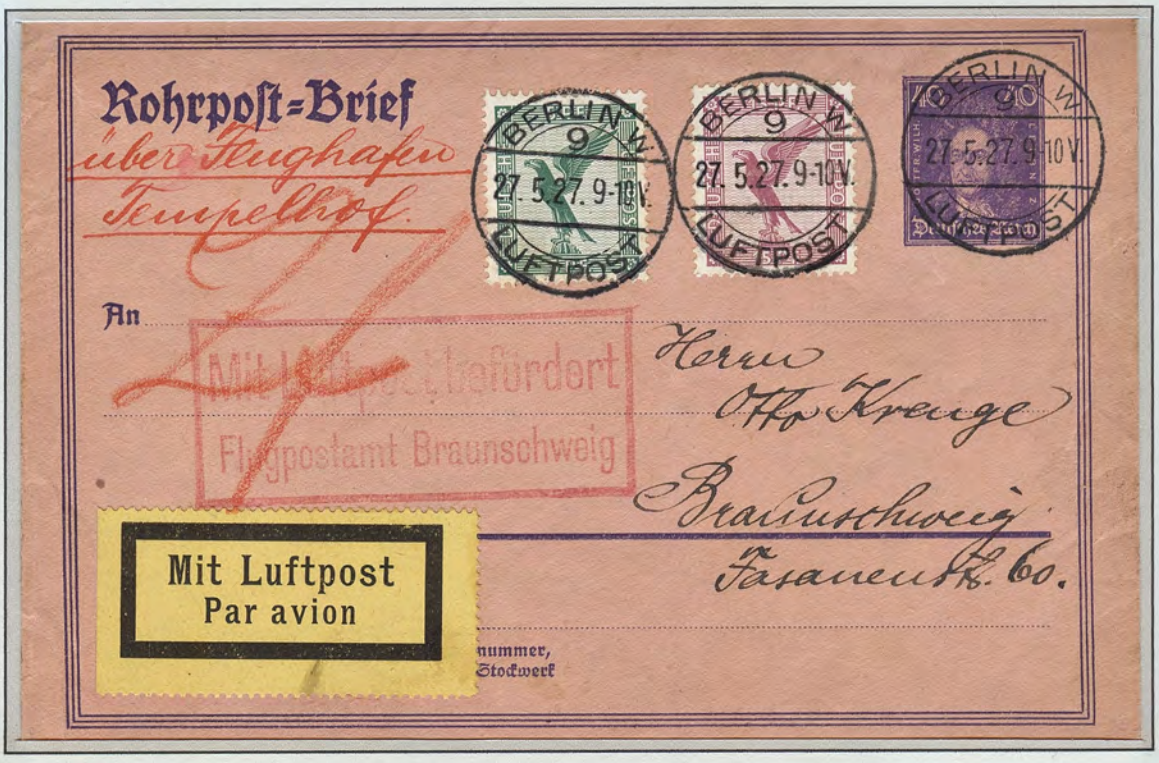
Letter card (France) edition 176 sold at 5c i.o. 15c;

Blaise Pascal bulk of his work was published post-humously; text: Encres Blaise Pascal Library.

▲ *Corner block of 4 with distinctive perforation shift error.*

CityPost local postal service (Germany):
detail Leibniz calculator

G. W. Leibniz (1646-1716) completed Pascal's calculator. He made the carry mechanism more reliable by using his own invention, "stepped drums". He also added the multiplier to the machine.



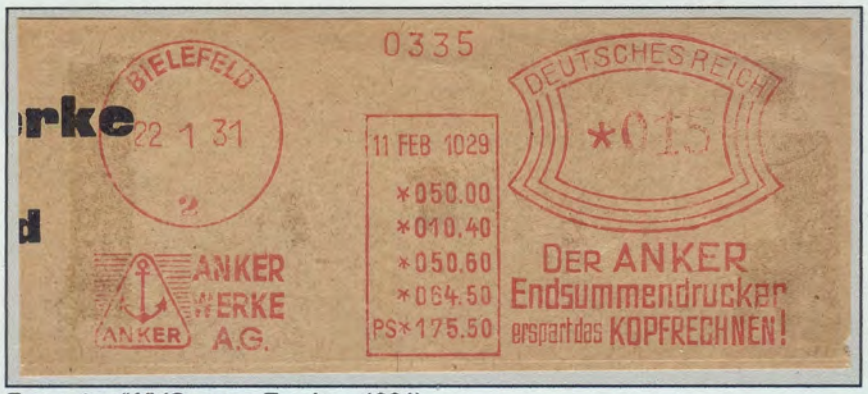
Pneumatic tube postal stationery (Berlin, Germany); envelope sent as airmail to Braunschweig. ►

Engineer **Phillip Mathieus Hahn** (1730-1790) developed in 1773 the first functional calculator based on Leibniz's Stepped Drum. He made these machines until his death.

His brother-in-law, **Johann Christopher Schuster** (1759-1823), a skilled watchmaker, continued with the manufacture and finished a cylindrical counting machine in 1822, which was assembled of 1025 individual parts.

◀*Francotyp "B" (German Empire - 1938)*

Around 1910 machines were invented which could perform all four arithmetic operations automatically.



Francotyp "A" (German Empire - 1931)
Check strip of a calculator text: saves on mental arithmetic

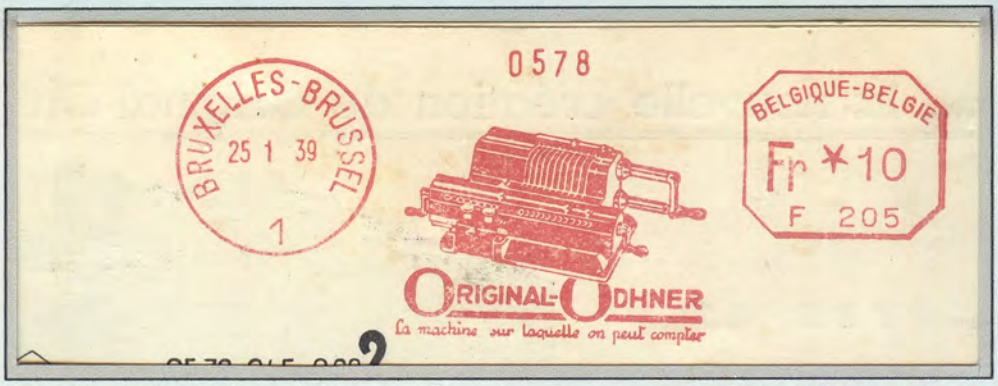
Supermétal Sar 11e

From the very beginning numbers and results could be printed on check strips, which improved the verification.

Postgiro envelope (Belgium - 1923)

mechanical calculator RECORD

These designs implied that those machines were like monsters; heavy (sometimes up to 30kg) and full of complex chain wheel combinations. Luckily with constant improving performance, reliability and weight, with maximum correctness of arithmetical operations and in producing results with rapidity never before equalled.



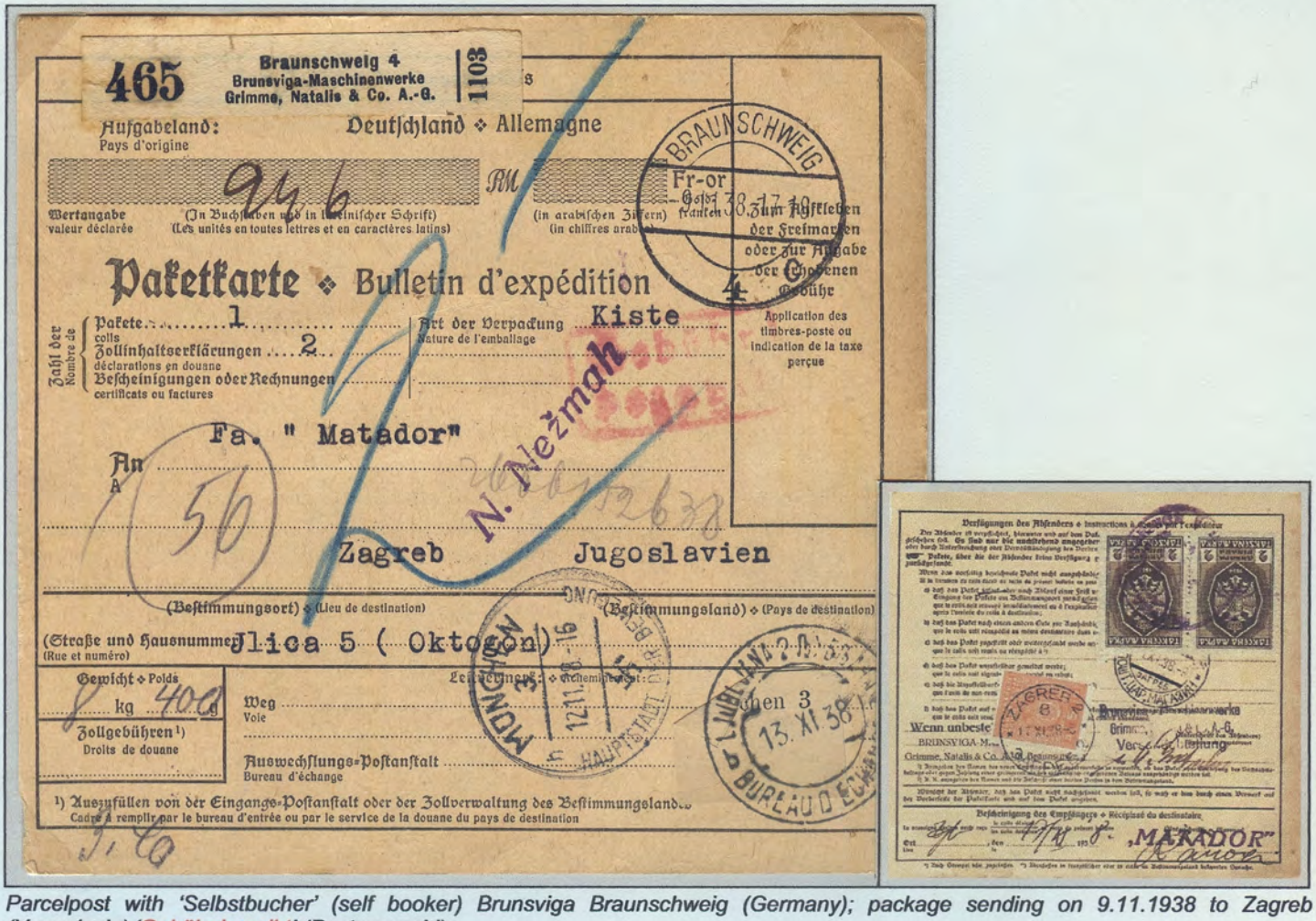
Francotype "C" (Belgium - 1938) Original-Odhner Type 27

Stationery (Romania); only stamp shown Odhner copy Triumphator

W.T. Odhner, a Swede working in Russia, constructed as first calculators with movable pins and variable-toothed gears. The benefit was ease of use and high reliability, and also a quite dramatic decrease of size and weight.

Hasler "F22" (Netherlands – 1937) Brunsviga model Odhner

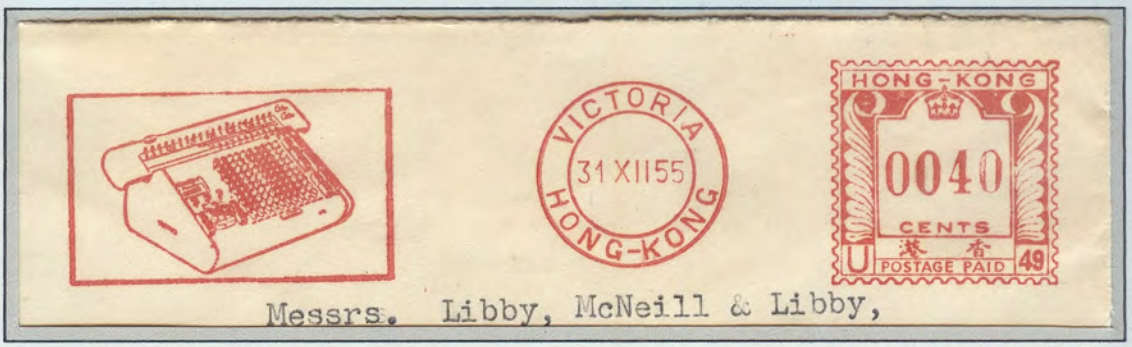
Brunsviga Co. and others took over the patent from Odhner and manufactured ten thousands of those machines.



Parcelpost with 'Selbstbucher' (self booker) Brunsviga Braunschweig (Germany); package sending on 9.11.1938 to Zagreb (Yugoslavia) 'Gebühr bezalht' (Postage paid).

Francotyp "Cc" (Germany) calculator brand Walther

Curta

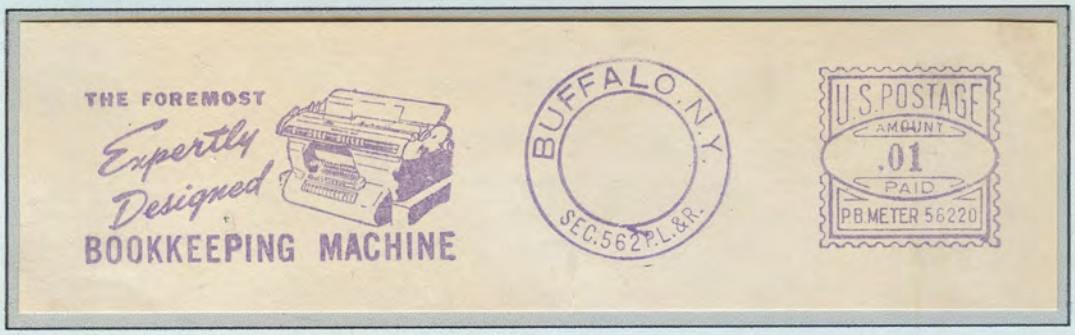


Universal "Multi-Value" (Hong Kong - 1955) Calculator Friden STW 10

All mechanical models had an hand-crank to rotate the wheels and perform the calculation. Manpower was needed! But there were also extremely compact and light weight calculators, compared to the big and heavy (monster) models.
The **Curta,** invented by Curt Herzstark from Liechtenstein, was a small, hand-cranked mechanical calculator introduced in 1947. The small cylinder design fits in the palm of the hand. It could perform all the operations like the large ones.

Postgiro envelope (France - 1936) calculators' brands Addo and Facit electrically empowered.

Desktop or portable calculators became common. Many engineering improvements made them smaller and lighter with the necessary strength of the parts. The electro-mechanical models were introduced already before WWII.



Pitney Bowes models "CV" (USA): type bulk post

After World War I bookkeeping and invoicing machines made their entrance in companies. Heavy calculators with typewriting and printing capabilities and were assembled together into one machine.

The main purpose was the production of accounting documents more complex than a simple totalled list.

Hasler "F66/88/99" slogan with different color (Denmark - 1957)

Postgiro envelope (Belgium)

bookkeeping machine (right) Astra having 16 accumulators registers.

These automated machines were the real monsters complex and often weighted more than 100 kg.

AUTUMN CHILLS bring on first RHEUMATIC PAINS! By rubbing well with

COLMAN'S

MUSTARD OIL

Rheumatism may be avoided.

BLAKEMORE'S

PATENT ADJUSTABLE

TILED ASHGUARDS

Are CHEAPER, MORE CONVENIENT, and FAR PRETTIER than Ashpans, and are adjustable to different widths of Fire Grates, have nicely-finished Iron Frames with various kinds of Tiles, also Brass Panels.

WHOLESALE—

BLAKEMORE'S

14, RIDGEFIELD,

MANCHESTER.

THE NATIONAL CASH REGISTER

"TILL"

THIS REGISTERS THE AMOUNT OF YOUR PURCHASE.

Invaluable to every Retail Tradesman.

PATENTED.

J. W. ALLINSON,

European Agent,

95, STRAND,

Corner of Beaufort Buildings,

LONDON.

THE NEW AMERICAN "ACME"

Lemon Squeezer and Knife

COMBINED IN ONE MACHINE.

PATENTED.

Sole European Agent:

J. W. ALLINSON,

95, STRAND,

LONDON ENGLAND.

THE MIDDLESEX HOSPITAL,

MORTIMER STREET, W.

Patron—THE QUEEN'S MOS

Treasurers—R. RUTHVEN PYM, E

Bankers—Messrs. COUTTS. Secr

The Hospital contains 307 beds. Av

Out-patients 30,942.

There are 34 beds set apart for Pa

received without letters of recommendati

and kindness can suggest is provided

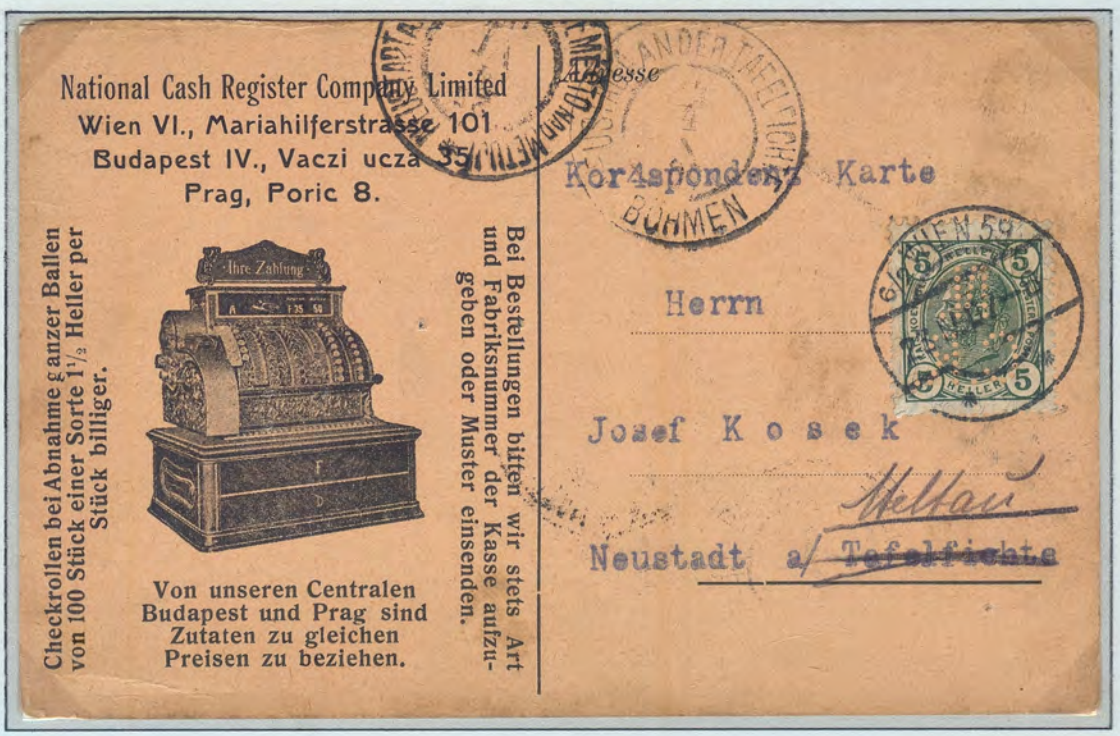
The first cash registers appeared in the market around 1879, as heavy mechanical simple adding machines.

When the cash drawer opens a bell rings

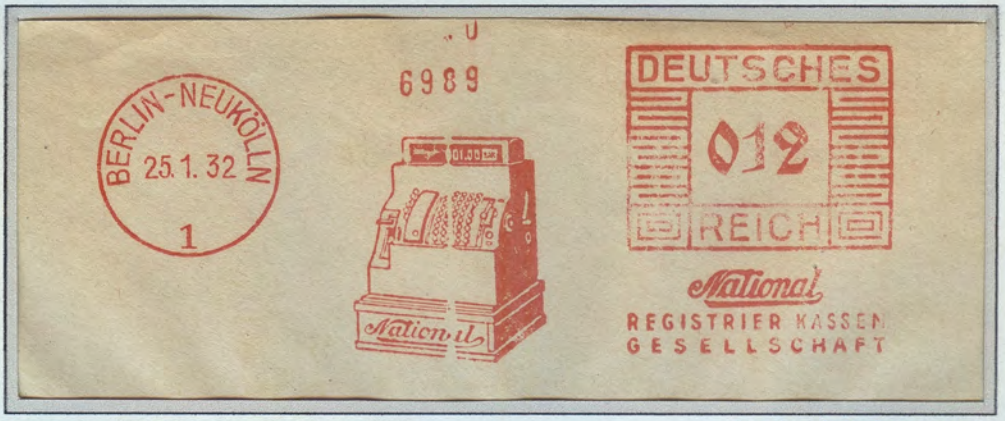
Those cash registers were invented for the purpose of eliminating employee theft. An employee was required to bring in every transaction on the register, and when the total key was pushed, the cash drawer opened and a bell rang, alerting the manager that a sale took place.

Stationery printed to order (Great-Britain); QV 1p sold for ½p - Anglo-Colonial Letter issued Dec. 22, 1888

In 1885 J. Allinson became the first active sales agent in UK and opened in 1886 a London Office, which was established in one room at 95 The Strand under the name of the "National Cash Register Till Co".



*Perforation (Austria - 1907) **N.C.R.** (National Cash Register company) Commercial card sent from Vienna to Neustadt, Germany on 23 April 1907*



Francotyp "B" (German Empire - 1932) National Cash Register

In 1879 James and John Ritty patented a cash register and in 1884 John H. Patterson and his associates acquired the Ritty patents and established National Cash Register Company (NCR). NCR had the biggest market share and sold 2 million devices each year.

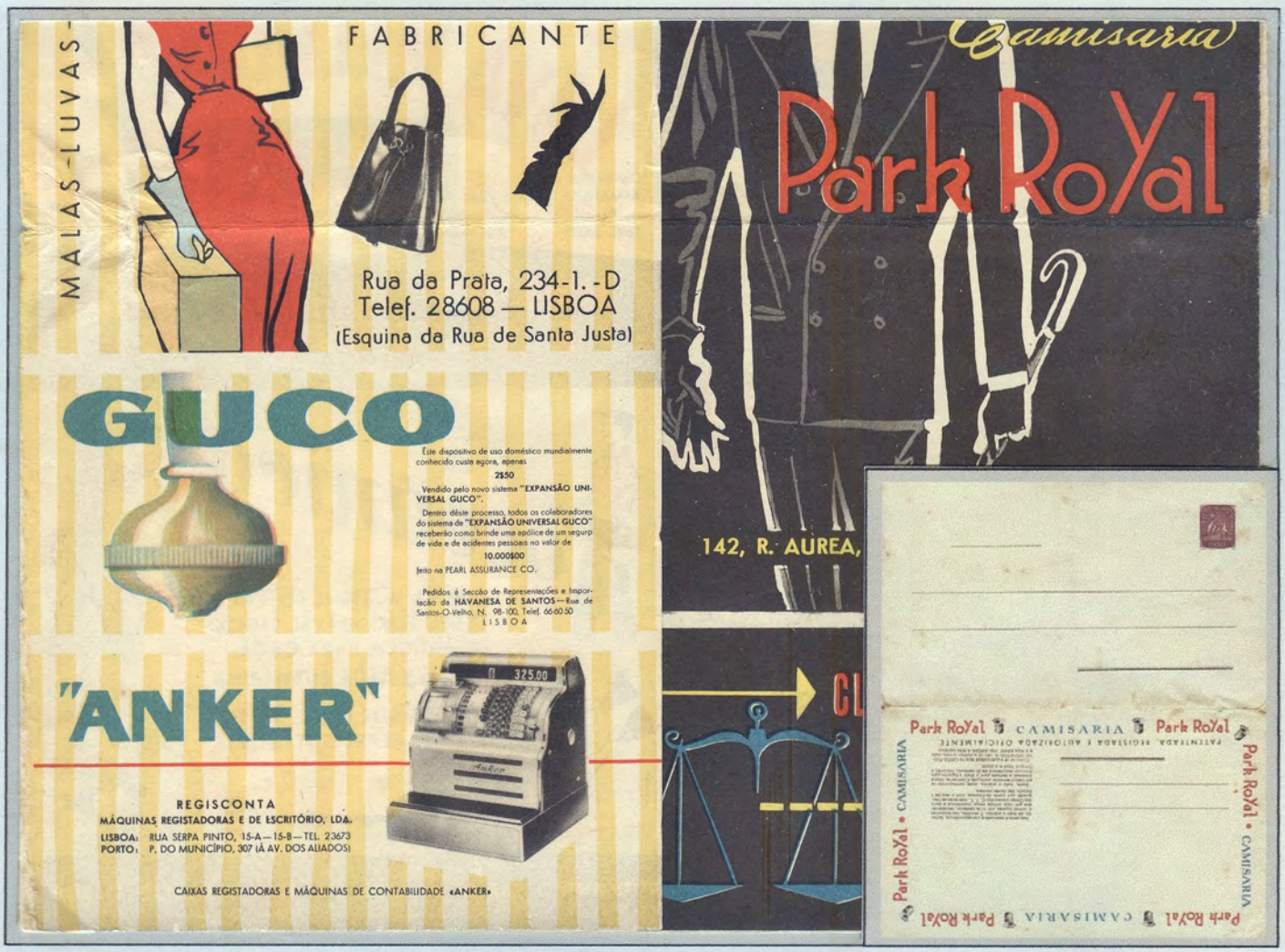
Censored letter from New York to Stockholm (4 jan 1944); The US Postal Service introduced in 1931 meter stamps, which were produced by National Cash Register meter model P-1924(3-3)P-P, a multi-value machine.

Although NCR had an extremely dominant position worldwide, it wasn't the only manufacturer. Slowly the competition was growing.

Cash registers followed every evolution in the calculator industry. These calculators have found their way into the common world of stores and warehouses.

Francotyp "A" (German Empire - 1934)

ANKER Cash register



Stationery printed to order (Portugal 15.11.1955) Series A-5/a sold at reduced price of 50%

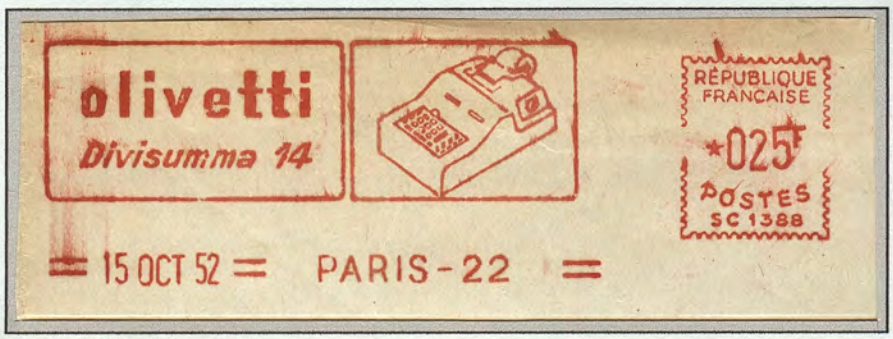
ANKER Cash register

Commercial Controls model "14" (USA - 1948)

Clary Cash Register

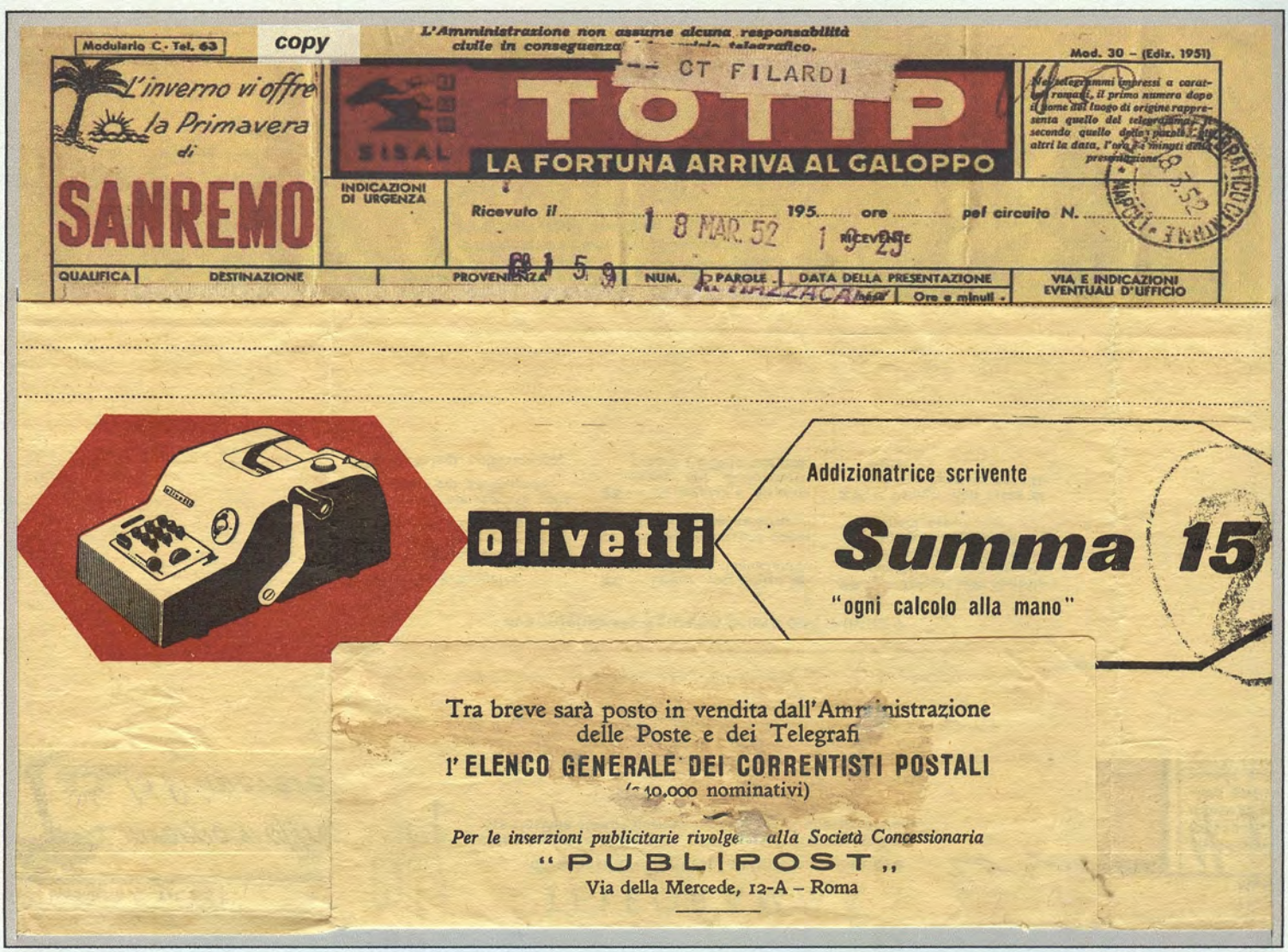
As we notice those cash registers became available in electronically driven versions providing nice printing results, security, reliable, availability, and also reduced size and weight.

Hasler "F88" (Denmark – 1965)



Satas "S" (Italy – 1952)

Instead of requiring the operator's hand to exert the force and power needed to set the numerical registers and do the calculation. The power could be drawn from electrical energy. The speed of operations had only mechanical limits and later electronically.



Telegram (Italy – 1952)

Even the early electromechanical desktop calculators were as large as many of today's personal computers.

Postgiro envelope (Lausanne, Switserland - 1945)

ill. Precisa: electrical printing calculator

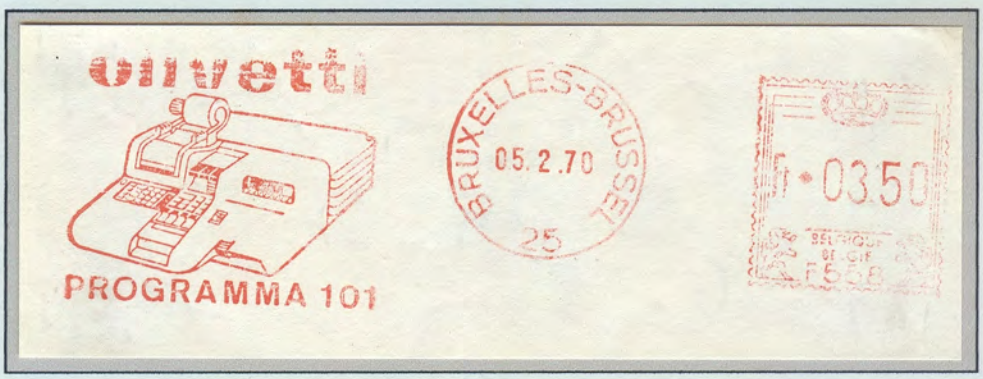
With the inventions of thermionic valves, transistors, and then hard-wired integrated circuit logic they were soon replaced by smaller electronic devices and enlarged capabilities.

Postgiro envelope (France - 1975)

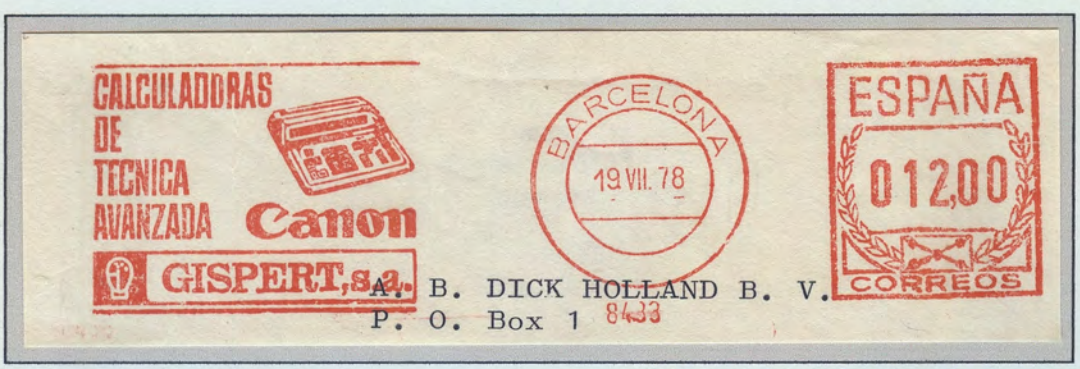
ill. AddMaster - text: electronical printing calculator

Elka 55

Friden 130; the first electromechanical calculator



The first electronic calculator was created in the early 1960s. Pocket-sized devices became available in the 1970s as the incorporation of ICs reduced their size and cost.



Frama "M/E bzw.100" (Spain)

ill. Canon advanced technical calculator

They became cheap and were able to do more than the four conventional main operations, also able to memorize results, and in later versions able to be programmed by the user.

Stationery (Cuba)

Most students use calculators for schoolwork and become "too dependent" on it; why not learn to calculate in the head.

In 1822, the English mathematician **Charles Babbage** (1792-1871) demonstrated the concept of memory in a form so that his machine (Difference machine) could handle calculations without any human intervention. The idea came as an actuary in an assurance company, from the repetitive calculations he had to do to verify hundreds of tables, and detected a lot of errors in those tables.

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AMES DOWNER, Esq.

pital.

that entitle the Assured *to participate in the profits.*
who have been assured four years on the equal scale of premiums.
The bonus declared in 1834 averaged £16 per cent. on the premiums then paid; and the bonus awarded in 1839, *on the average, equalled* £31 *per cent. on the premiums received during the preceding five years.*

4thly. Assurers may have the bonus applied to increase the sum assured, or in reduction of future premiums, either for the remainder of life or for the next five years only.

5thly. Policies granted without any charge to the Assured beyond the stamp duty.

6thly. An option given to Assurers, on the increasing scale of rates, after the lapse of any number of years, to commute the future increasing premium by an equivalent equal annual one for the remainder of life, and thereafter to participate in the profits. The same advantages are applicable to Assurers on the decreasing scale of rates.

7thly. Policies on the lives of parties dying by suicide, duelling, or by the hands of justice, not void as respects the interests of persons to whom they have been legally assigned.

8thly. No extra charge for residence in any part of Europe, nor for proceeding (in a decked, sailing, or steam vessel,) from any one Port thereof to another during Peace, to Assurers not being seafaring men by profession. Licenses are granted to go to any part of the world upon terms proportionate to the risk.

9thly. Whole-life policies on the equal scale of premium purchaseable after four years. Lapsed Policies revived on favourable terms to the Assured.

The Board-day is every FRIDAY *at ½ past Two o'Clock; but appearances may be taken on any day between the hours of* 10 *and* 12 *in the morning, before either of the Medical Officers, at their respective Residences, as stated above.*

TABLES.

WHOLE LIFE.

Equal Rates of Premium.

I. TABLE of Annual Premiums required for an Assurance of £100 for the whole Term of Life.

Age.	Annual Premium. £ s. d.
15	1 10 8
16	1 11 5
17	1 12 3
18	1 13 0
19	1 13 10
20	1 14 7
21	1 15 5
22	1 16 3
23	1 17 2
24	1 18 1
25	1 19 0
26	2 0 0
27	2 1 0
28	2 2 0
29	2 3 1
30	2 4 3
31	2 5 5
32	2 6 8
33	2 8 0
34	2 9 5
35	2 10 11
36	2 12 6
37	2 14 2
38	2 15 11
39	2 17 9
40	2 19 9
41	3 1 10
42	3 4 1
43	3 6 6
44	3 9 0
45	3 11 9
46	3 14 7
47	3 17 8
48	4 0 11
49	4 4 4
50	4 8 0

II. TABLE showing the Annual Premium Payable during Ten Years only, to Assure £100.

Age.	Annual Premium. £ s. d.
20	4 2 6
21	4 4 0
22	4 5 6
23	4 7 1
24	4 8 9
25	4 10 5
26	4 12 1
27	4 13 9
28	4 15 6
29	4 17 4
30	4 19 2
31	5 1 1
32	5 3 0
33	5 5 0
34	5 7 1
35	5 9 5
36	5 11 9
37	5 14 2
38	5 16 8
39	5 19 3
40	6 1 11
41	6 4 8
42	6 7 6
43	6 10 6
44	6 13 10
45	6 17 4
46	7 0 11
47	7 4 7
48	7 8 4
49	7 12 4
50	7 16 5
51	8 0 9

Increasing Rates of Premiums.

Annual Premiums increasing every Fifth Year until the Twentieth inclusive, after which period a fixed Annual Premium is payable during the remainder of Life.

Age.	Premium per Cent. per Annum payable during: First Five Years.	Second Five Years.	Third Five Years.	Fourth Five Years.	Remainder of Life.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
15	1 2 9	1 6 7	1 10 1	1 13 7	1 17 7
16	1 3 5	1 7 3	1 10 9	1 14 5	1 18 7
17	1 4 1	1 7 11	1 11 5	1 15 3	1 19 7
18	1 4 9	1 8 6	1 12 2	1 16 1	2 0 8
19	1 5 5	1 9 2	1 12 10	1 16 11	2 1 9
20	1 6 0	1 9 10	1 13 7	1 17 10	2 2 11
21	1 6 8	1 10 6	1 14 4	1 18 10	2 4 2
22	1 7 3	1 11 2	1 15 2	1 19 10	2 5 5
23	1 7 11	1 11 10	1 15 11	2 0 10	2 6 9
24	1 8 6	1 12 6	1 16 9	2 1 11	2 8 1
25	1 9 1	1 13 2	1 17 8	2 3 1	2 9 7
26	1 9 9	1 13 10	1 18 7	2 4 4	2 11 2
27	1 10 4	1 14 7	1 19 6	2 5 7	2 12 9
28	1 11 0	1 15 4	2 0 7	2 7 0	2 14 6
29	1 11 7	1 16 2	2 1 8	2 8 5	2 16 4
30	1 12 3	1 17 0	2 2 10	2 10 0	2 18 3
31	1 12 11	1 17 11	2 4 1	2 11 8	3 0 4
32	1 13 7	1 18 10	2 5 4	2 13 5	3 2 6
33	1 14 4	1 19 10	2 6 9	2 15 3	3 4 9
34	1 15 1	2 0 11	2 8 4	2 17 3	3 7 3
35	1 15 11	2 2 1	2 9 11	2 19 5	3 9 10
36	1 16 9	2 3 4	2 11 8	3 1 9	3 12 7
37	1 17 8	2 4 8	2 13 7	3 4 3	3 15 6
38	1 18 8	2 6 2	2 15 8	3 6 10	3 18 8
39	1 19 9	2 7 9	2 17 10	3 9 8	4 2 0
40	2 0 11	2 9 5	3 0 2	3 12 8	4 5 6
41	2 2 2	2 11 4	3 2 9	3 15 11	4 9 3
42	2 3 6	2 13 4	3 5 5	3 19 4	4 13 3
43	2 5 0	2 15 6	3 8 5	4 3 1	4 17 6
44	2 6 8	2 17 10	3 11 7	4 7 0	5 2 0
45	2 8 5	3 0 4	3 15 0	4 11 3	5 6 10
46	2 10 4	3 3 1	3 18 8	4 15 9	5 12 0
47	2 12 5	3 6 1	4 2 7	5 0 7	5 17 5
48	2 14 8	3 9 4	4 6 10	5 5 9	6 3 3
49	2 17 2	3 12 10	4 11 5	5 11 4	6 9 5
50	2 19 10	3 16 7	4 16 3	5 17 3	6 16 1

*** *By comparing the rates in* No. I. *with those of* No II. *it appears that this Table offers peculiar advantages to those to whom the least possible present payment is desirable.*

PERIOD ASSURANCES.

TABLE of Annual Premiums required for an Assurance of £100, for the respective Terms of One and Seven Years.

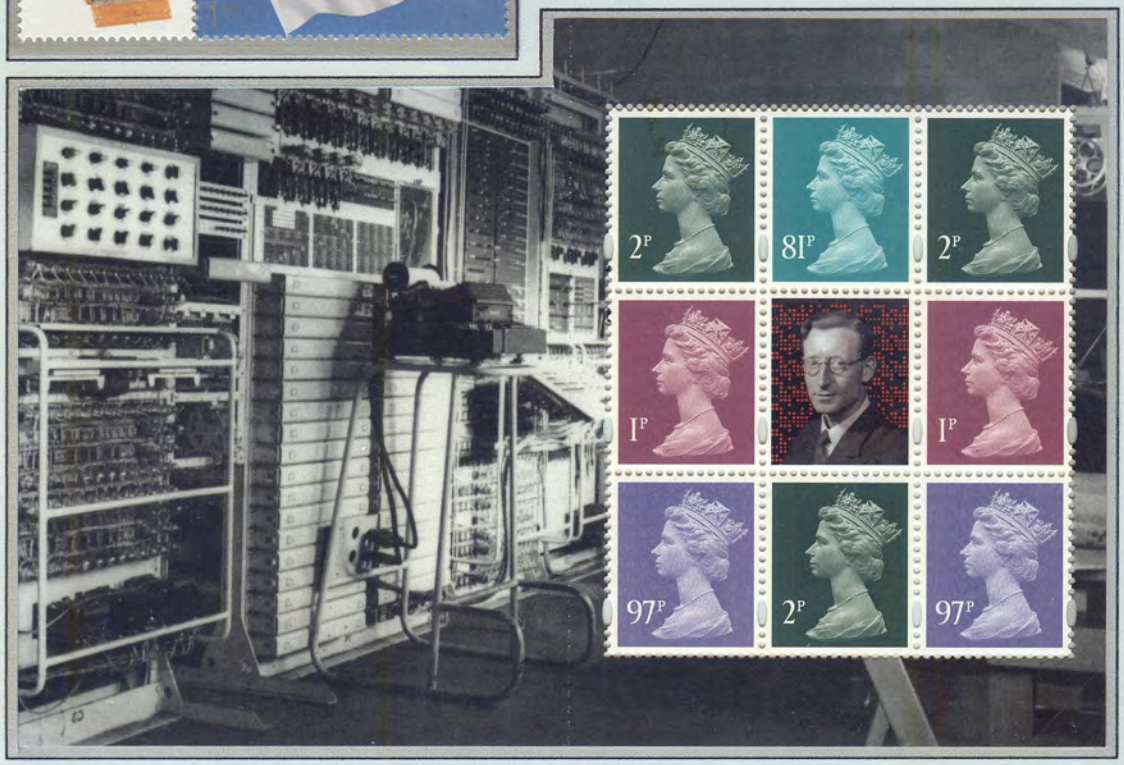
Age.	One Year. £ s. d.	Seven Years. £ s. d.
15	0 16 3	0 18 0
16	0 16 10	0 18 7
17	0 17 6	0 19 4
18	0 18 1	1 0 0
19	0 18 9	1 0 11
20	0 19 5	1 1 9
21	1 0 2	1 2 6
22	1 1 0	1 3 4
23	1 1 10	1 4 1
24	1 2 8	1 4 10
25	1 3 5	1 5 7
26	1 4 2	1 6 3
27	1 4 11	1 6 11
28	1 5 8	1 7 9
29	1 6 4	1 8 3
30	1 7 0	1 8 11
31	1 7 8	1 9 7
32	1 8 3	1 10 3
33	1 8 11	1 10 11
34	1 9 7	1 11 7
35	1 10 3	1 12 4
36	1 10 11	1 13 1
37	1 11 7	1 13 11
38	1 12 4	1 14 9
39	1 13 1	1 15 9
40	1 13 11	1 16 9
41	1 14 9	1 17 10
42	1 15 9	1 19 0
43	1 16 9	2 0 0
44	1 17 10	2 0 11
45	1 19 0	2 1 11
46	1 19 10	2 3 1
47	2 0 9	2 4 4
48	2 1 11	2 5 11
49	2 3 1	2 7 8
50	2 4 4	2 9 7

Mulready privately printed (Great-Britain - 1843) According to Babbage this actuarial table with life assurance premiums; containing lots of errors, due to human repetitive calculations, from this he believed this could be avoided when using his Difference Machine.

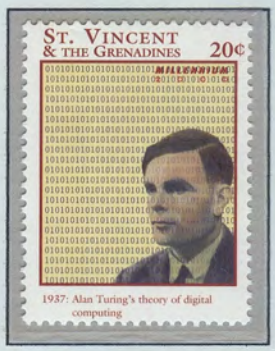
During World War II, the British Government Code and Cypher School at Bletchley Park, outside London, broke the German coded messages generated by the famous **Enigma**.

Rejewskin, a Polish mathematician, and two colleagues, deduced the secret internal wiring of the **Enigma,** but still it was a very time consuming task to break all incoming messages.

Rejewskin (left) and Enigma (bottom)



◄ *pane prestige booklet.*
T. Flowers & Collosus (left)

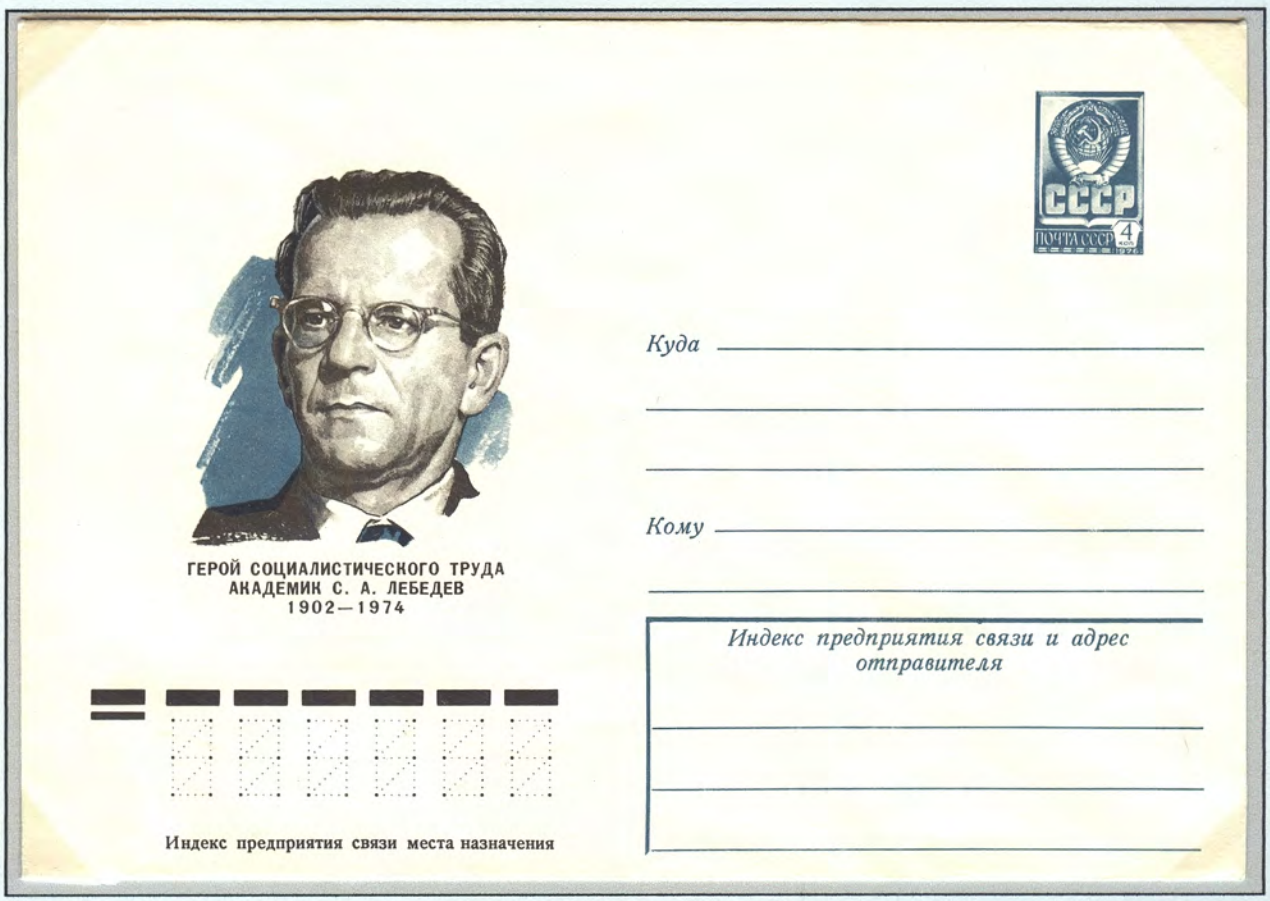


Alan Turing and **Tommy Flowers** build the world's first electronic and programmable computer **"Collosus"**. It got the name because of the big number of vacuum tubes (1850) used to be able to decode the German messages. Ten of those computers were completed and used, and were crucial for deciding start of D-Day.

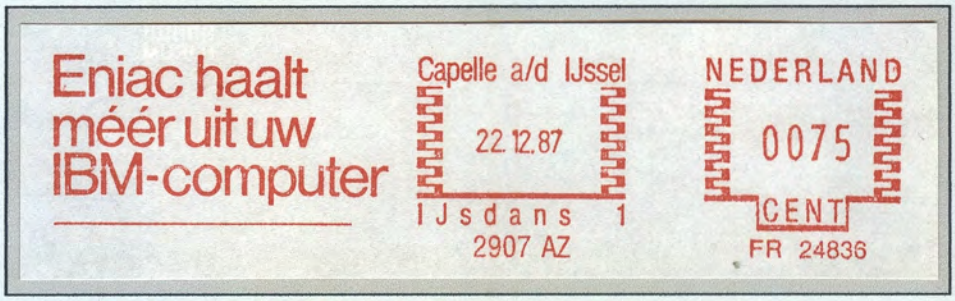
Secret PO box 111 letter (Great-Britain – 4.03.1943): undercover mail address of Bletchley Park, sent via FPO 676 at Inverness, Scotland with RAF censor cancel.

Bletchley Park

During WW II **Konrad Zuse** (1910 - 1995) developed the computers Z3 and Z4 and was the first to demonstrate how to load a program. In 1949 Zuse re-established his own company under the name Zuse KG and completed the Z4. The Z4 can be considered as the first commercial computer in operation.



In 1946 **Sergei Lebedev** (1902-1974) developed as head of the Kiev Electro technical Institute of the Ukrainian Academy of Sciences with his team the first computer in the USSR. The MESM (meaning translated Small Electronic Calculating Machine) had about 6000 vacuum tubes, did fixed-point binary representation, used parallel arithmetic processors and could operate at an average speed of 50 operations per second.



Eniac Company called after the famous first American computer

Meanwhile in the U.S. in 1946 the **ENIAC** (**E**lectronic **N**umerical **I**ntegrator and **A**utomatic **C**omputer) was completed by two American university professors, **John Mauchly** and **Prosper Eckert**, using as first the Babbage concepts.

Shifted perforation

The Eniac, extremely large and heavy (5m x 24m – 30 ton) was developed at the University of Pennsylvania.

◄ *U.S. Postal Service issued below stamp commemorating the 50th birthday of the ENIAC and the computer technology that have followed*

cancel Aberdeen Proving Ground, Maryland 24.04.1951 ►

In 1947 it was transferred to U.S. Army Ordnance Corps in **Aberdeen Proving Ground**, Maryland, where it was in continuous operation until October 1955 to support the American ballistic research lab. It was able to calculate a trajectory in 30 seconds that took a human 20 hours.

Dr. Atanasoff, from Bulgarian origin, and graduate student C. Berry built successfully the **A**tanasoff-**B**erry **C**omputer (ABC) at Iowa State College during 1939-42. The machine was only capable of solving up to 29 simultaneous linear equations, further development stopped due to WW II assignments.

An American mathematician with Hungarian roots, **Johannes von Neumann** (1903 - 1957) engineered the first computer that loaded a stored program into memory and executed it. This machine, called EDVAC (Electronic Discrete Variable Automatic Calculator), was created at the University of Princeton.

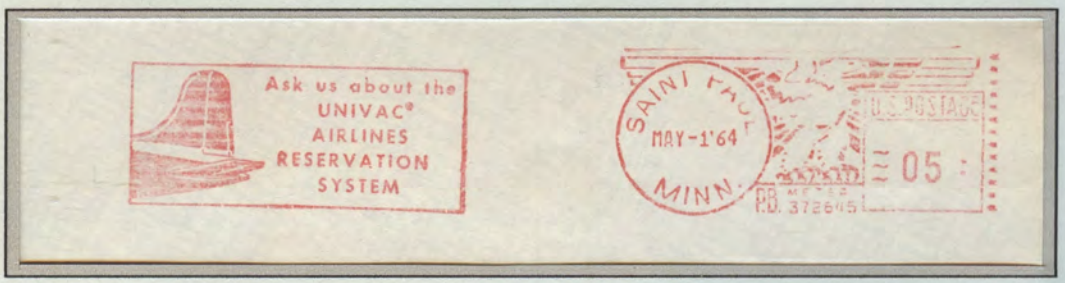
Francotyp "Cc/Ccm" (Sweden) ►

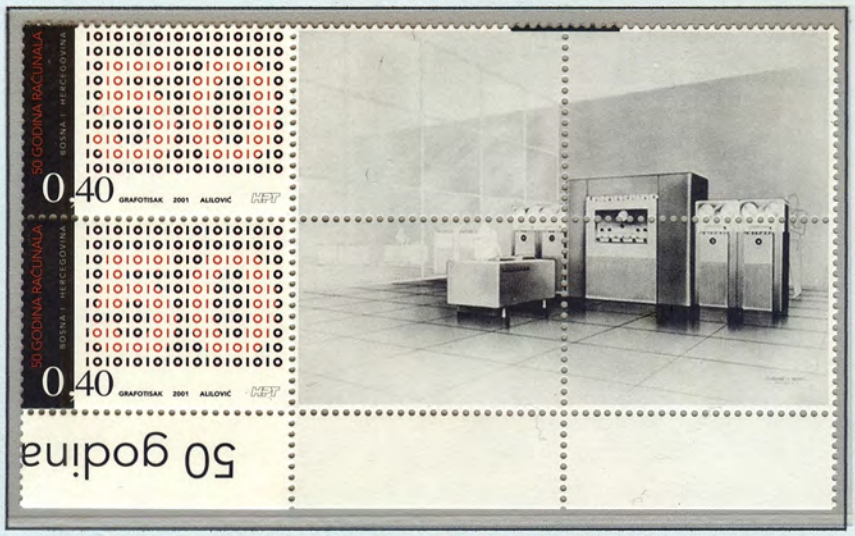
In 1951 the first commercial computer was successfully developed, the **UNIV**ersal **A**utomatic **C**omputer (UNIVAC). It was part of the so-called 'First Generation Computers'; they were built with tubes.

Magenta color missing

In 1955 Lawrence and Elmer Sperry, founders of the Sperry Corp., acquired the Eckert-Mauchly Computer Corp. and Remington-Rand, developers of the Univac system. The company name changed to Sperry Rand and later (1986) merged with Burroughs and exists today under the name of UNISYS.

The Univac airlines reservation system (part of USAS) is still in use today but is slowly diminishing and is being replaced with Open Source and Front-End products.





"Fifty years computers" UNIVAC exists 50 years

The second generation of computers (1958-1964) is identified by the use of transistors instead of tubes, enormous reduction of used space, use of higher level of computer languages, tape-devices and removable disks. The third generation computers (1964-1970) use integrated circuits, which result in dramatic reduction of power and space. A lot of attention goes to high availability and stability.

Die proof (Ivory Coast) design by P. Forget Mainframe **IBM 360/40** model; bottom right Magnetic core memory

This generation was completely dominated by IBM's first commercialised "computer family", the **IBM/360** series announced in 1965. Lots of major companies were buying and using these systems. In the beginning IBM didn't believe that companies would spend that amount of money in computers. The successes of the **UNIVAC** took away every doubt, and IBM started a big campaign. In 1956 it became number 1 and is still today a market leader in the computer business.

3rd Generation CPU; EC 10xx series

German Company Robotron

The fourth generation computers started around 1970 having IC's that contain many processing circuits. Also Timesharing was introduced, being the optimal use of the processor power and time by dividing it between all users of that CPU. This allows many users to work at the same time on a single computer.

Roneo Neopost "205" completed box (Australia) CDC 6600 mainframe computer

Echocard (Japan) text: minicomputer IBM AS/400

Color trials

Mainframe and mini-computers (as **IBM AS/400**) are meant to be available 24hrs a day and 7 days in a week. Maintenance on these types of systems are planned and are using fail-over systems.

The needs for smaller computers became visible in the 70s, and they were available under the name minicomputers.

Inflation (German Empire - 1923) stamp with highest value ever issued: 50 billion (50 miljarden), one sheet has 100 stamps gives 5 trillion (5 billionen), see border.

A supercomputer in 1985 could count from 1 to 5 trillion in a sec. Today they do it 20 million times faster. Or same as cracking a password with 95 characters with all numbers, upper and lowercase letters and special characters in one second.

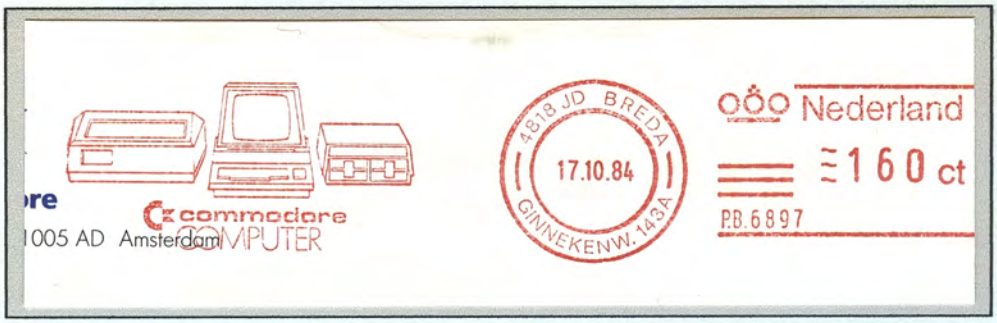
A supercomputer is used mainly for particular highly calculation-intensive tasks such as quantum physics, climate research, forecasting and, encryption technology by searching for the next prime number. US; china and japan are key players.

Registered letter (Argentina) ▶ number 876023 is a prime number.

Supercomputers are always in search for the next prime number.

Processing capacity or speed of calculation is measured by number of FLoating point Operations Per Second. Todays supercomputers can do 1.759 PFLOPS (Peta=10^{15} =1000 trillion).

Stationery (China – 2001) numbered Shanghai Supercomputer Center

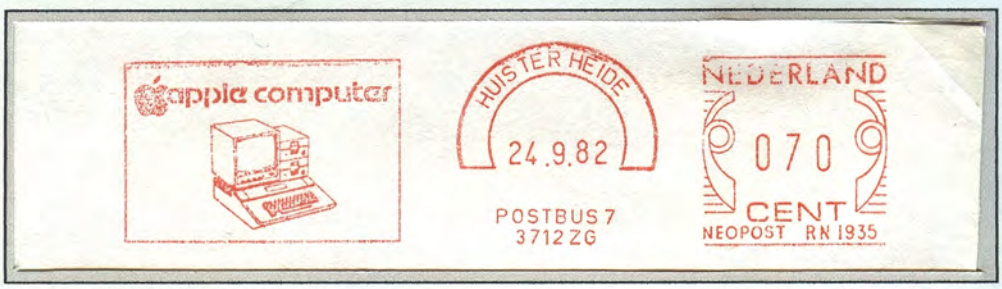


Altair, Tandy (TRS-80), Atari and **Commodore** constructed the first microcomputers in the late 70s.

APPLE II reached markets in 1979

Steve Jobs and Steve Wozniak

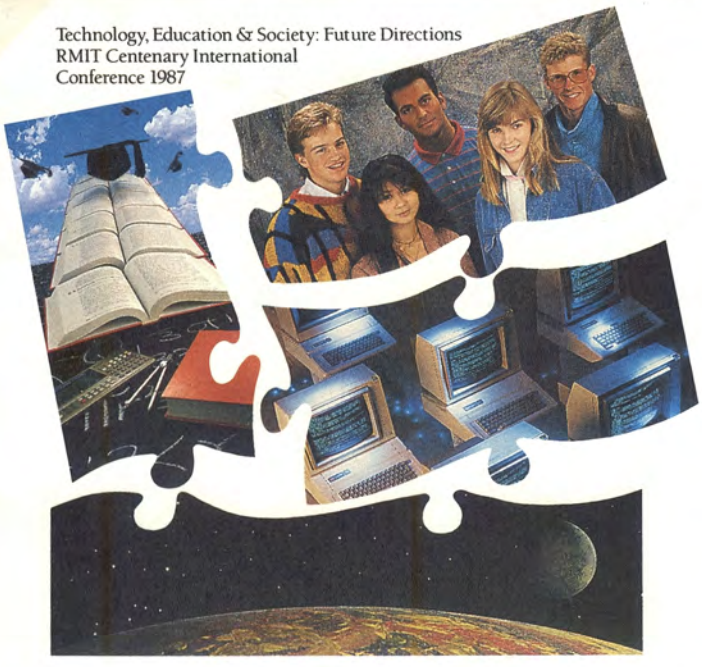
In 1976 Steve Jobs and Steve Wozniak developed their first Apple computer in their garage.



Neopost "2205" (Netherlands)

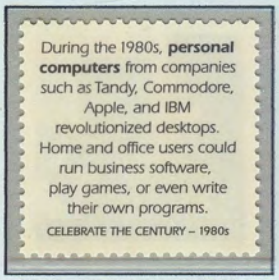
Apple II

In 1979 they reached the markets with the Apple II model and already in 1983 the Apple Company became one of the Top 500 companies.



B. Van Tenac
7 Main St.,
LOCKLEYS SA 5032

APPLE II E -model



Back of stamp (USA)

On March 8, 1983 IBM launched their "Personal Computer", the IBM PC XT with an 8088 processor, as product number **5160.** XT stands for e**X**tended **T**echnology.

*Double print central image **(VÖB exp)***

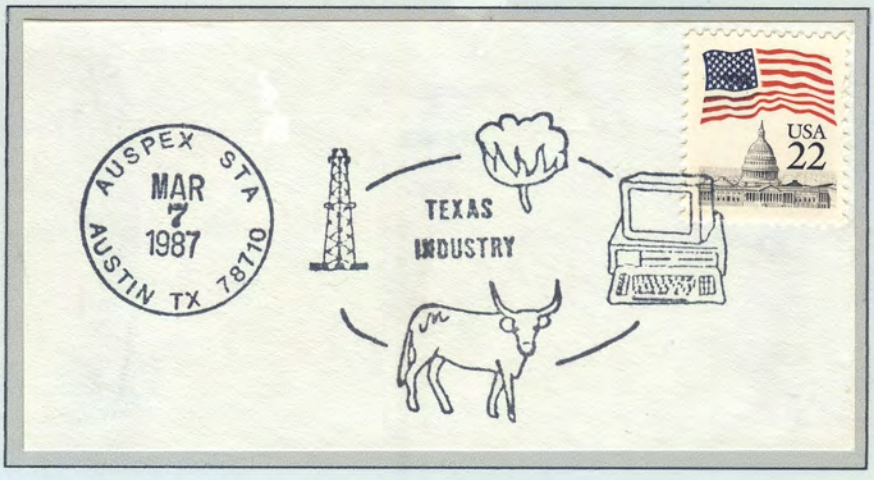
IBM/XT was the first computers with standard hard drive and a BASIC operating system.

▲ *Echo card (Japan)*
IBM PC 5550 is the Asian version of the IBM PC XT, with special more powerful processor for eastern languages.

▲ *Specimen meterstamp SECAP model S (France)*

Olivetti M24 (8086 processor)

Eighteen months later the new architecture was a proven standard and got more than 50% of the market share. Thanks to many other manufacturers like e.g. Olivetti.



From then on everybody talked about PC or home computer that replaced the word microcomputer.

Francotyp "Cc" (Israel) ►

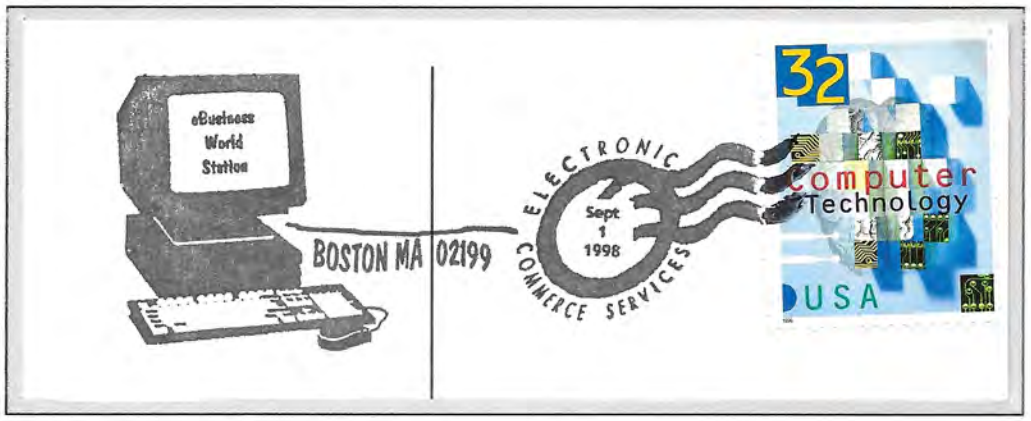
After the XT came the AT PCs, second generation PC. AT stands for 'Advanced Technology'. It was a more robust system having a 286 or higher type processor, a 20MB hard disk and more advanced graphical interface.

IBM's efforts to trademark the name AT largely failed and many computer manufactures copied the 286-based architecture, called clones. Most systems with processor types 286, 386, 486 and Pentium CPUs, and at least some with Pentium Pro and Pentium II processors, were describable as AT-class. A processor is needed for processing the programmed instructions.

Private Booklet (Israel:

IBM PS/2 (Personal System/2) with 2 80286 processor

The PS/2 line was created by IBM in an attempt to recapture control of the PC market by introducing an advanced yet proprietary architecture, which was not a big success due to its hardware incompatibility.



In the PC-world the processor type is one of the major differences. The processor speed is dependent on the type of the processor types; following types exist 8086, 286, 386, 486 and 586 (Pentium) processors. The Pentium processors empowered with dual or quad core technology.

Personal Computers don't differ that much from big mainframes; besides the fact that PC's are much smaller, there is a major difference; a PC reacts on the movement of the mouse and the mainframe only reacts after the "enter"-key is hit. The result is that PC programs can be user-friendlier.

Robotron A512C

Portable computers appeared on the market shortly after the introduction of the Personal Computer. In the beginning they were transportable because the screen, keyboard and processor were integrated in one box.

With the introduction of the flat screens the LAPTOP became flat, slim and very light (few kg).

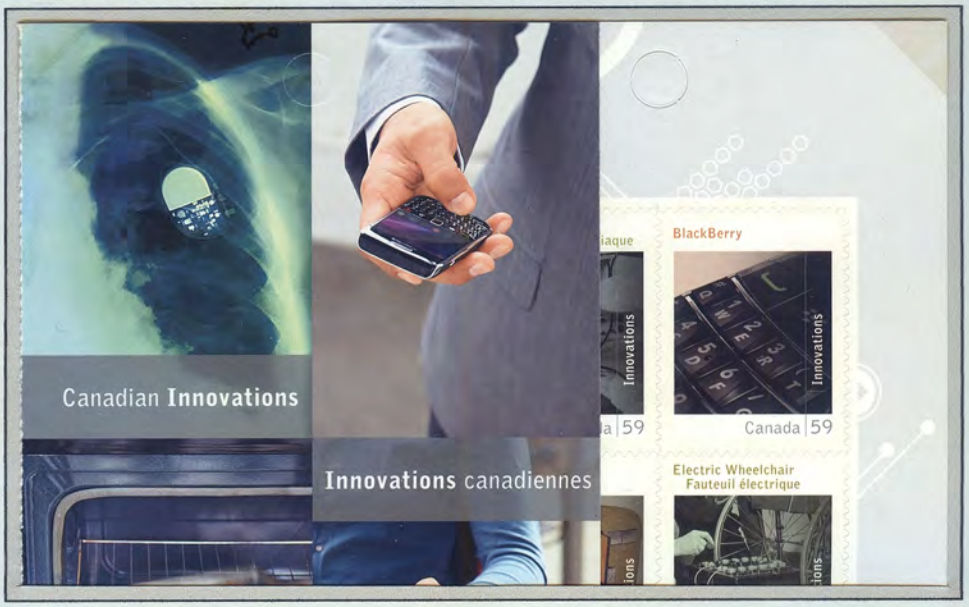
A Laptop of TOSHIBA model J-3100SL

The word LAPTOP exists out of LAP and TOP. So, it is a PC that you can put on your lap.

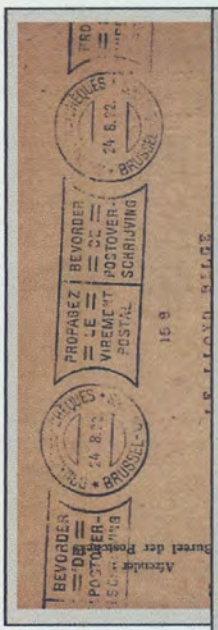
Neopost "Frankmaster 505" – Prefix H (Germany)

The story of the electronically "one hand-design" devices, often called handheld, palmtop or PDA (Personal Digital Assistants) started already with certain electronic calculators in the early 80's and even the idea existed begin 1920s.

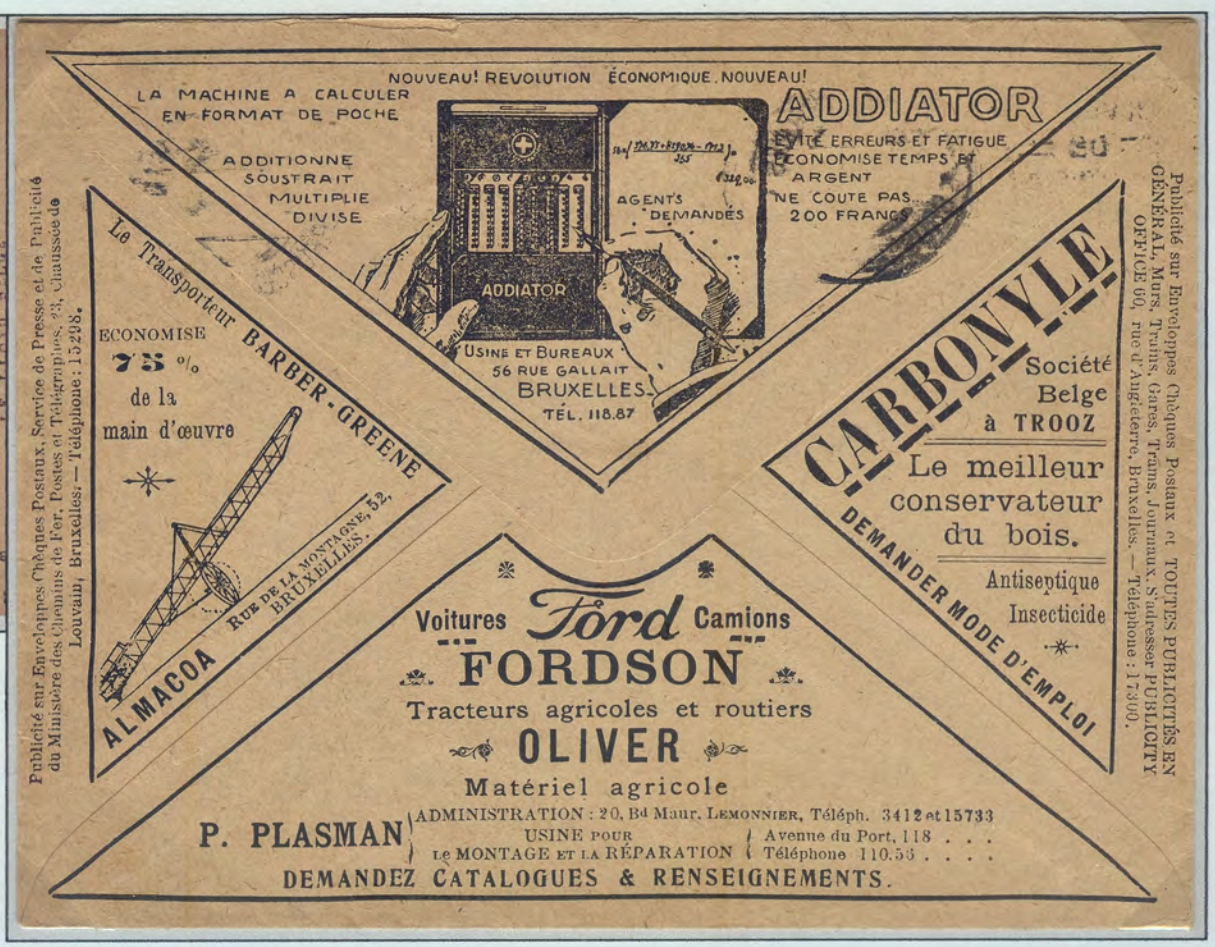
▲ PDA BlackBerry ►



The small and light-weight device that help people to manage and organize their personal and professional lives by providing instant information, anytime access to agendas, phone numbers, to-do lists, calculator and many other ...



Postgiro envelope (Belgium)



mechanical hand calculator ADDIATOR. size 17 x 12cm, weight is 300gr.

Phablet

A phablet is blended from the words phone and tablet and combines a phone with all other applications and functionality in one device, designed with a screen which is intermediate in size between that of a typical smartphone and a tablet computer.

The larger display offers a better visual experience for viewing web pages or multimedia sources, but can be bulky in a small shirt or pants pocket.

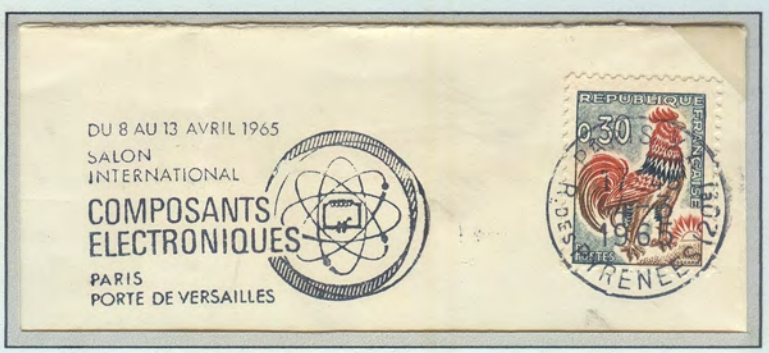
The smartphone and all equivalent handhelds is growing market since 2000s and overtook shipments of both laptops and tablets worldwide in the second quarter of 2013.

Industry exhibition since 1798 till 1806

To become an industry means convincing investors and raising funds to deploy the first devices. This was what the first inventors did at exhibitions.

◄ *color proof* ▲*Black proof (France) design A. Decaris after Bertaux*

The first industry exhibitions were an idea of Napoleon's minister of internal affairs, François Neuf-château. They took place 1798, 1801, 1802, 1803 and 1806 in **"Hotel des Invalides"** and later in the grand court of the Louvre in Paris. In 1802 Jacquard, inventor of the punch card driven loom, received the bronze medal for it.
Later those exhibitions became the famous world exhibitions or, more specific technology exhibitions.

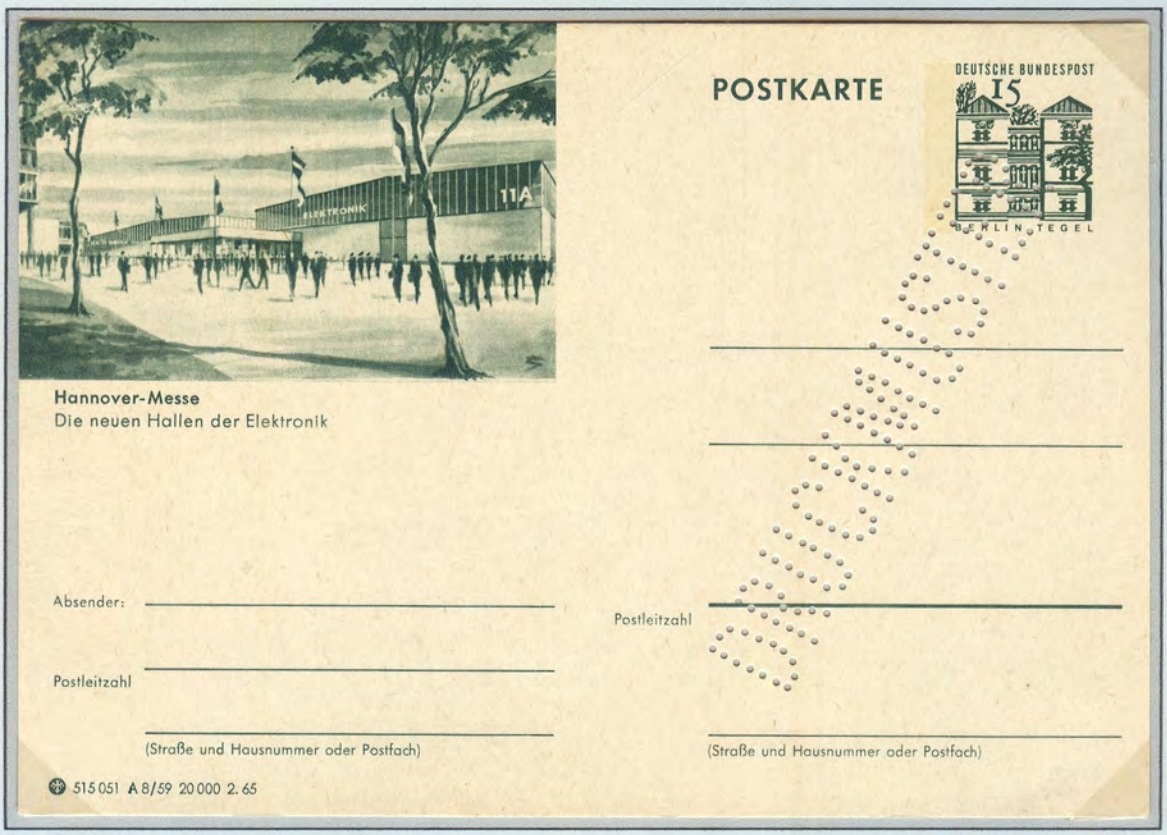


Stationery printed to order (Bayern - 1913) Bureau Exhibition

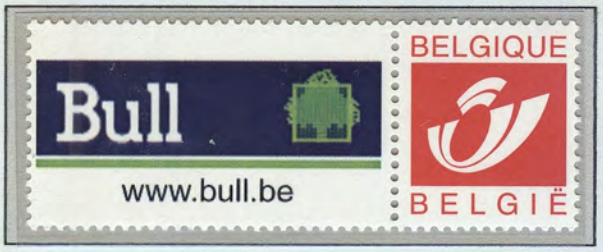
Marketing is enormously important and companies have always recognized the importance of being present on exhibitions, like ...

CeBIT (Centrum für Büro- und Informationstechnik) exhibition in Hannover.

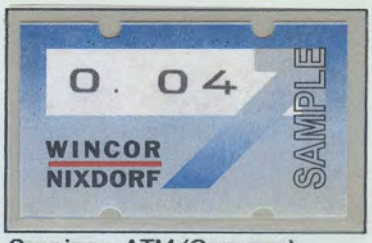
Hannover ***CeBIT***, the biggest in Europe, demonstrating and promoting new technologies. It realizes bigger name recognition by being in the picture, that's how computers got into everybody's day life.



Proof Stationery (Germany - 1959) Hannover Exhibition since 1947



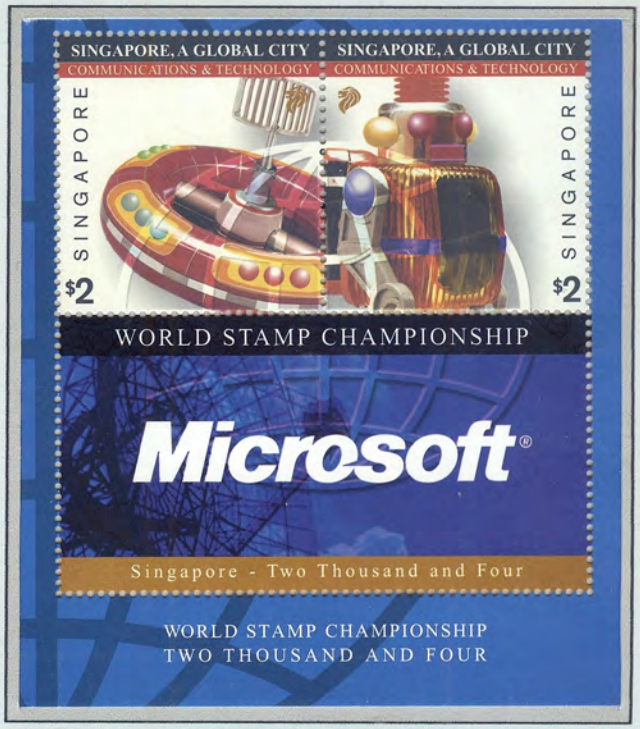
◄ *Personalized stamp Type B (Belgium); used from 1.12.2001 till 30.05.2002 Printed on phosphor paper*



Specimen ATM (Germany)

Big computer players spend billions of dollars on marketing. Branding; being awidely-recognized trademark.

▲ Communication specialist 3Com sponsoring a yacht.



Miniature sheet (Singapore): partial view

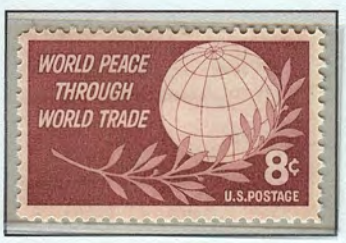
A brand is the personality that identifies a product, service or company (name, term, sign, symbol, or design, or combination of them) and how it relates to key constituencies: customers, staff, partners, investors etc. Sometimes computer manufacturers managed to have access to the postal stamp world.

Prestige Booklet page (Wales, Great Britain)

Japanese computer company Sony

Thomas J. Watson Sr (**incorrectly** mentioned as George J. Watson) CEO of IBM.

International Business Machines Corporation (commonly referred to as **IBM** got this name in 1926, before named as CTR) is an American multinational technology and consulting corporation, with corporate headquarters in New York. IBM manufactures and markets computer hardware, middleware and software.



Satas 'R' bilingual (Lebanon)

IBM slogan

Thomas J. Watson Sr, CEO of IBM and also chairman of the ICC (International Chamber of Commerce) launched in 1937 the slogan 'World Peace through World Trade'

Occasional postmark (US) issued for the U.S. pavilion at the EXPO'58 in Belgium

Who doesn't remember the presence of IBM in the U.S. pavilion at the **World's Fair EXPO '58** in Belgium where an IBM RAMAC system answered questions on world history in 10 languages? Or who remembers the commercial with Charlie Chaplin to promote their IBM XT PC, which became a standard for the personal computer market?

IBM, a world trader, has worldwide the most recognized logo in the world. In 1956 the letters "IBM" took on a more solid, grounded and balanced appearance. Since1972 horizontal blue stripes replaced the solid letters to suggest "speed and dynamism". Recognition is key in the IT business.

1.8 Calculating became IT industry.

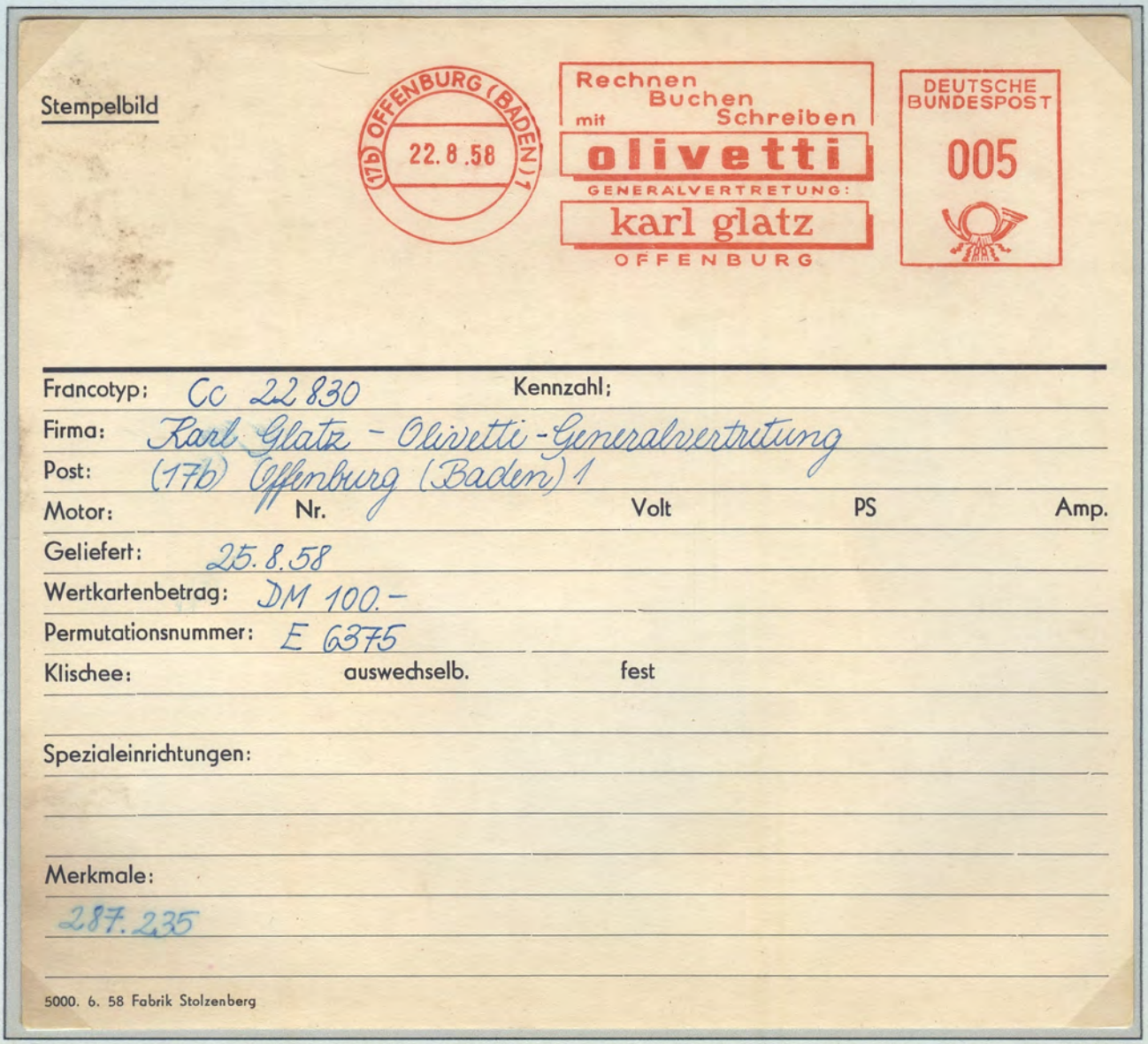
As an example how manufacturers were able to promote their ideas and products to the consumer. Olivetti, an Italian manufacturer of calculators and typewriters, switched later to PC-industry.

Olivetti was the first in the world that managed to promote their product and name on an official (Italian) post stamp. ►

IBM compatible PC Olivetti M24

Heavy Colour shift (ED certificate)

Stamp booklet (Switserland); Olivetti publicity on cover back



A Francotyp company specimen card; these type of cards record registration date and number, change of publicity by requestor, sample strike of the meter mark, etc…

2

The Physics of a computer, the hardware.

2.1 What's in the box?

Vacuum tubes

'Porte Timbre' postage stamps (Russia - 1925); sold in a post office with reduction

Advertisement of radio tubes.

Timbrographe meterstamp (Belgium - 1939)

radio tube of Tungsram

The first computers, like ENIAC, Colossus and Atanasoff-Berry Computer (ABC), developed in 1940s were constructed with all kind of electrically elements and radio tubes, also called vacuum tubes, invented in 1906.

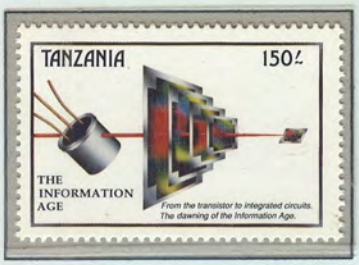
missing perforation

The ENIAC filled a 70m² room, weighted 30 tons, used more than 18.000 tubes consuming 175KW of electricity power.

Telegraph receipt (Ottoman Turkish)

advertisement radio tube of Tungsram.

The Hungarian company Tungsram was founded in 1896 and produced worldwide vacuum tubes. They were taken over by General Electric in 1990.



2 Penny tax; mandatory as support for suffering Berlin just after 2nd World War

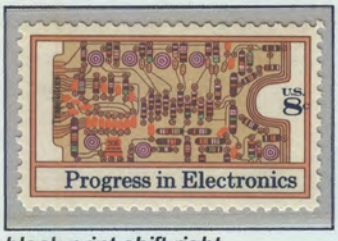
The second generation of computers, started around 1959, was built with transistors and resistors.

Misperforation (Great-Britain) small perforation central stamp without Queen's silhouette and face value
transistor symbol

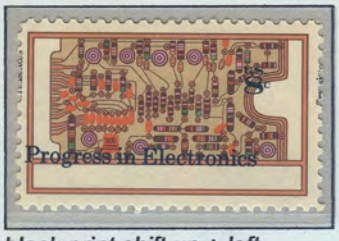
The transistor was invented in 1948 and was the first start of the miniaturization of the computer.

Francotype "Cc" (Netherlands) symbol vacuum tube and semi-conductor transistor

These semi-conductors were less expensive, smaller, required less electricity, and emitted less heat than vacuum tubes. The introduction of circuit boards is a fact. The second advantage was increase of the calculation speed and reliability.

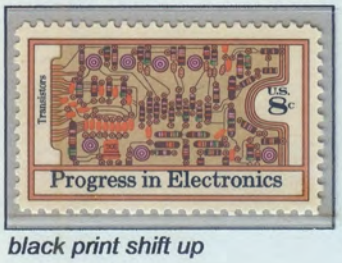


black print shift right

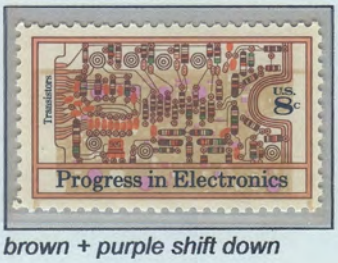


black print shift up + left

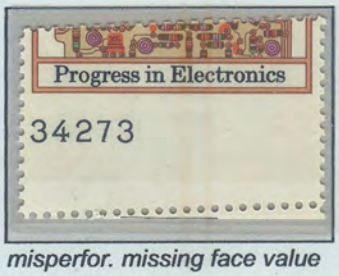
One small error in these circuit boards meant the whole board became useless and replaced, as it was cheaper than searching for the error and repair the board.



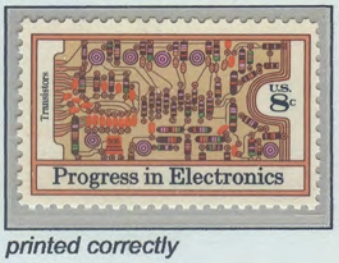
black print shift up



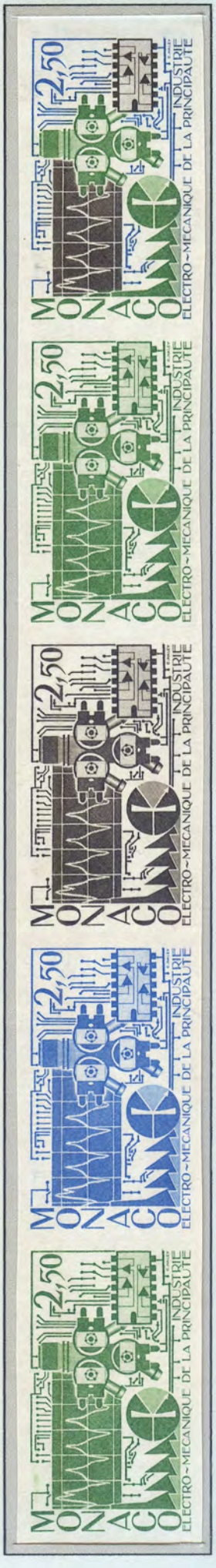
brown + purple shift down



misperfor. missing face value



printed correctly



Color proofs

◄ ▲ Magnetic core memory; bottom right

core memory (right)

Typically for the second-generation computers was the use of magnetic cores memory. It was introduced as central storage memory. Cores can be magnetized, and can be read again by detecting if a core contains a 1 or 0; meaning a core is loaded positive or negative.

Magnetic core memory

Jack Kilby

Microchip 600X enlarged

Specimen (Mexico) partial successful perfin MUESTRA

The third generation of computers appeared in 1965. They started to use Integrated Circuits (IC), invented in 1959 by **Jack Kilby** of Texas Instruments. The evolution of 'chips' went very fast. By the beginning of the 21st century, the ICs had over 100 million transistors on it, with the total number of components including resistors, capacitors, and conductors being even larger. Result of increasing efficiency and compressing on each mm² and less power consumption.

Hasler "Smile" (Netherlands)

Integrated Circuit (IC)

Those microchips were massively in use since 1971 as central memory, processor and control.

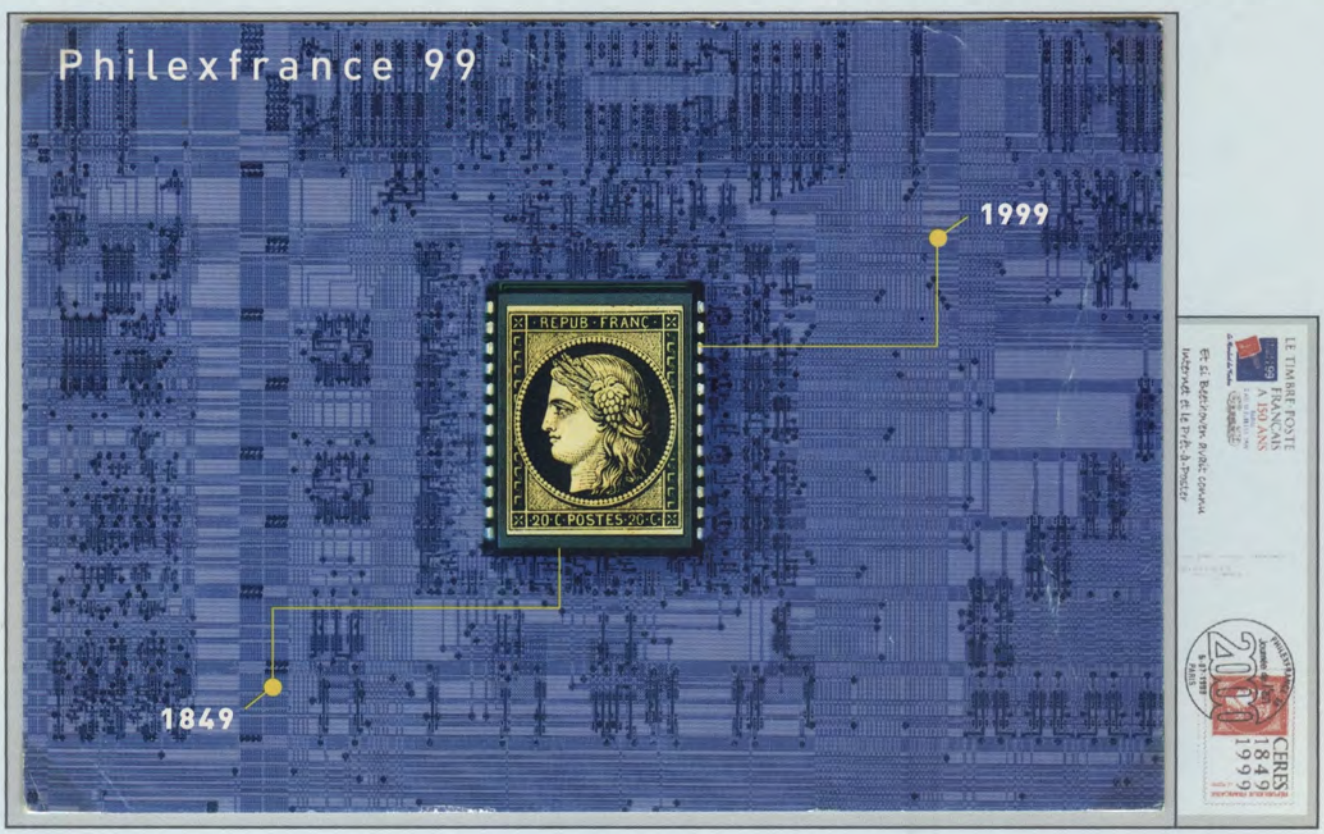
◄ *Color trial proof (Monaco):*
Integrated Circuits (ICs)

The speed of the computers is now measured in millionths of a second, the term MIPS is born; **M**illions of **I**nstructions **P**er **S**econd.

*Letter sent as **"PD"** from Guyanne Cayenne on 17.11.1864 rated 70c and canceled with 64-dot losenge arrived in Toulon, France on 16.12.64, via Paris 14.12.64, Paris Gare de Lyon 14.12.64 and Nice 16.12.64.64 - representing a quad-core 64-bit processor; every dot is a bit and can be either 1 or 0, also can address 2^{64} bytes in memory.*

Adding another board containing dozens of ICs was an easy way of extending a computer.

Today's ICs have **quad-core 64-bit** processors, meaning 4 independent units can read and execute central processing unit (CPU) instructions such as add, move data, and branch. Each core operates in conjunction with other circuits such as cache, memory management, and input/output ports. With respect to hardware, 64-bit is referencing the width of the registers on a computer's microprocessor or memory.



2.2 The oldest input device, the keyboard.

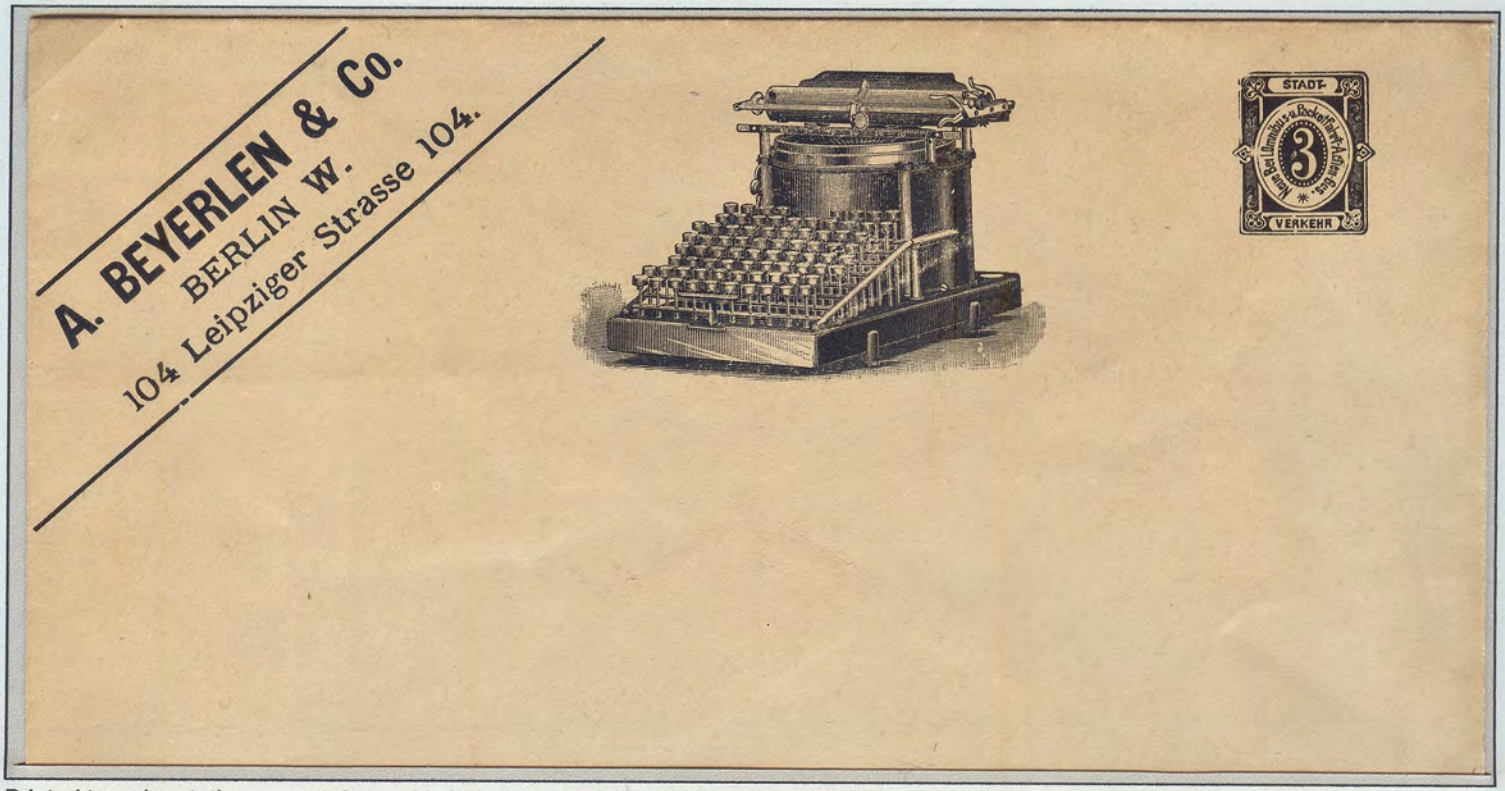
Maybe we don't realize but the typewriter stood model for the computer keyboards of today.

The typewriter, invented by **Peter Mitterhofer** (1822-1893) in 1864 and was put into production begin 1870s.

The first models like **'Caligraph'** had a 'full' QWERTY keyboard to avoid keys to jam and typed only in capital letters. Typing 'blind' was required; to see the writing the typist had to lift up the carriage.

Registered letter (Austria) cancel

typewriter of Mitterhofer



Printed to order stationery envelope with 3pfg Black (Berlin – Neue Berliner Omnibus- und Packetfahrt Actien-Ges. – 1888)

typewriter 'Yost' based on Sholes & Glidden typewriter with double keyboard.

A practical commercial machine was produced in the United States in 1867 by Christopher Latham Sholes and was manufactured by the Remington Company and placed on the market in 1874. All typewriters also able to type small letters were given a double keyboard with in total eight rows of keys: three for lower case, three for upper case and two for figures and symbols.

LIQUORE STREGA

UFFICIO EMISSIONE BUSTE-LETTERA POSTALI
A FAVORE DELLA FEDERAZIONE DEI COMITATI DI ASSISTENZA AI MILITARI CIECHI, STORPI E MUTILATI
ROMA

Copy recto

On. Signore,

Per speciale concessione governativa, ratificata con Regio Decreto N. 1678 del 29 Ottobre 1920, sono state messe in circolazione le Buste Lettera Postali simili a quella su cui scriviamo: esse hanno avuto la più entusiastica accoglienza da parte del pubblico.

Le Buste-Lettera, affrancate con francobollo speciale, vengono vendute ad un prezzo inferiore di cinque centesimi al valore nominale del francobollo appostovi; sicchè, con l'uso di esse, il pubblico viene a risparmiare su ogni lettera cent. cinque di francobollo oltre ad aver gratis la busta e la carta.

In questi tempi in cui tutto rincara è un bel miracolo operare un ribasso di tal genere: cedere cioè un francobollo di quaranta centesimi per trentacinque e regalare inoltre la busta ed il foglietto.

Ci si chiederà come avviene ciò e la risposta è facile indovinarla: gli annunzi di pubblicità operano il miracolo!

La concessione governativa è a favore della Federazione Nazionale dei Comitati di assistenza ai gloriosi mutilati di guerra e l'iniziativa, che riveste un nobile contenuto, è destinata al più largo successo per l'enorme diffusione delle Buste-Lettera.

Alla S. V. non sfuggirà quale e quanta efficacia abbiano le inserzioni pubblicate sulle Buste-Lettera che vengono emesse in serie ed in modo che un

Scopo precipuo della Busta-Lettera è quello di diffondere la pubblicità assolutamente seria, che, fatta con questo nuovo e geniale mezzo, riesce superiore ad ogni altra che si possa immaginare. Basta pensare infatti che le Buste-Lettera arrivano dovunque; che ogni copia passa sotto gli occhi di parecchie persone; che penetra in ogni classe sociale; che viene conservata; per convincersi della sua efficacia come medium pubblicitario. Le inserzioni poi sono disposte in modo tale che si debbono assolutamente vedere.

Convinti di fare cosa utile a codesta spett. Azienda, chiediamo alla S. V. di voler studiare la nuova forma di pubblicità che abbiamo l'onore di proporre.

Per aver schiarimenti, copie di ordinativi, tariffe, che non impegnano in alcun modo, preghiamo di inviarci la cartolina di ritorno, che va staccata ed affrancata come stampe, e costituisce un altra utilità delle Buste-Lettera Postali.

Indirizzare: UFFICIO EMISSIONE B. L. P. MINISTERO PENSIONI, Via Veneto 50 - ROMA - e curar di scrivere nello spazio riservato al mittente il proprio indirizzo.

In tale attesa, ci è grata l'occasione per inviare distinti saluti e ringraziamenti.

Copy verso

IL DIRETTORE

ANSALDO

STABILIMENTI 40

CAPITALE 500 MILIONI

Macchina da Scrivere

Scrittura visibile

Yost

Per Bellezza di Scrittura

Senza nastro

Milano Via Dante 19 telef. 31-72

Cercansi agenti ovunque

Roma Via Muratte 38 telef. 96-44

typewriter 'Yost' model ◄ no 20.

Specimen of BLP - Busta Lettera Postale (Italy): series national 1-10; lettercard with advertisement in favor of Italian WO I-victims: Sheet with typed text proving 'specimen' status and explaining: "BLP ratified by Royal Decree 1678 of 29oct1920. BLP will be prepaid with special stamp sold at a value of 5c less then nominal value, … BLP will be printed minimum 100.000 and maximum 1.000.000 copies. …the purpose of this BLP is to spread the advertising absolutely serious, which made this new and ingenious idea successful more than any other can imagine. Just think about the fact that this BLP arrives anywhere, that every copy goes under the eyes of many people that penetrates every social class that is stored, to be convinced of its effectiveness as advertising… contact address is the Office Publishing B.L.P – Ministry of Retirement in Rome. --- end of resume of text.

As a persuasive salesman, G.W. Newton **Yost**, helped to convince the Remington Co. to produce the Sholes & Glidden typewriter. Later he formed his own company and the first typewriter bearing the ***Yost*** name came out in 1887.

2.2 The oldest input device, the keyboard.

'Porte Timbre' (Uruguay); sold in a post office at lower price.

advertisement of typewriter Remington (bottom right).

Shifted black print (Italy) Olivetti typewriter

End 1880s models introduced the shift key (instead of double keyboards) causing the carriage to shift position in order to type either a lowercase or capital letter. The shift key we use on our keyboards today does not cause the machine to shift mechanically, the name stuck.

First stamps of Uganda, issued in 1896, were typewritten. Violet V.R. version with frameline dashes showing on three sides. ***(RPS exp)***

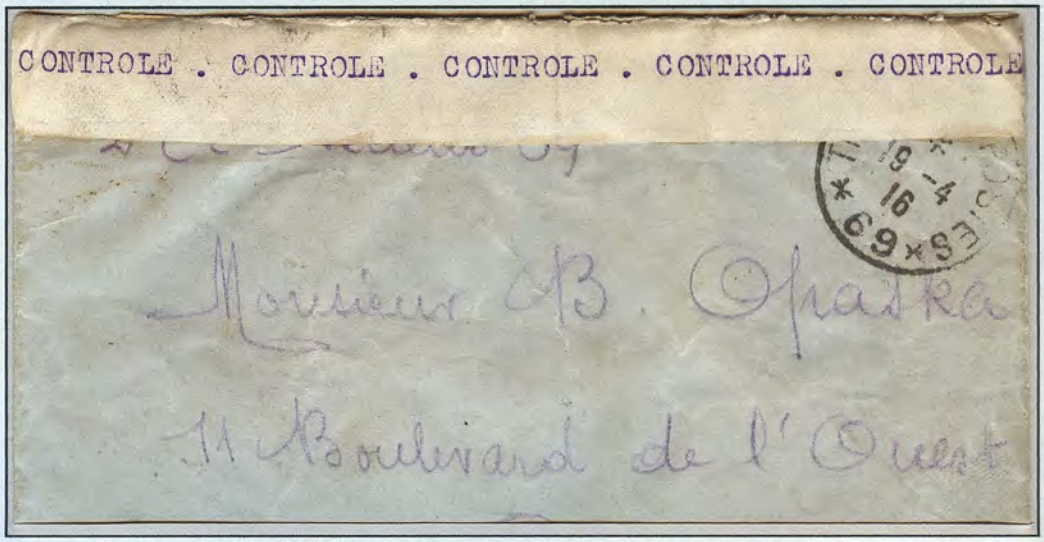
Tonga typewritten provisional black surcharge ***Half-Penny*** *on 1½d reading upward SURCHARGE on 2d blue King George I.* ***(BPA exp)***

Hasler "F22" (Spain - 1948) Underwood Rhythm Touch first model able to print in black and red

Stationery sold at reduced rate (Russia); sent to Brussels in Sept. 1899 'Yost' model 2 typewriter

The typewriter began to inspire the public and started appearing in offices as new source of employment, typing; people stopped complaining about the weird arrangement of keys and started memorizing the keyboard and learning how to type efficiently with the QWERTY/AZERTY variant, which is still in use today.

WW I (1916) provisional stamps British occupation (Long Island – Turkey). Typewritten on tin horizontally laid paper produced on a typewriter in the field.



Censor (France - 19.04.1916); typewritten censor strip on letter to Louviers

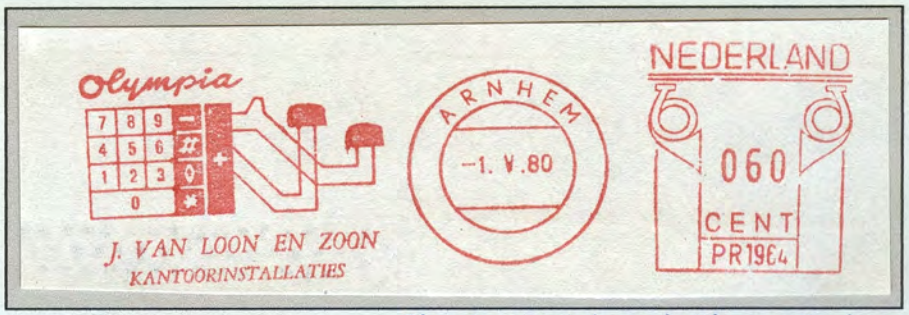
A few key technological developments, such as making it portable and avoid jamming keys, created the transition of the typewriter into a useful tool in the field.

Stationery printed to order (Spain);

Continental typewriter modified to be used in Europe.

For Europe some minor modifications were added to allow special letter writing. Continental was once a proud brand on European continent that gained almost full market share in period 1900s till 1950s.

WW I (1916) provisional stamps British occupation (Long Island - Turkey). Typewritten stamps on tin horizontally laid paper; typed with purple ribbon.



Postalia "P" (Netherlands) Olympia numeric keypad with operating keys

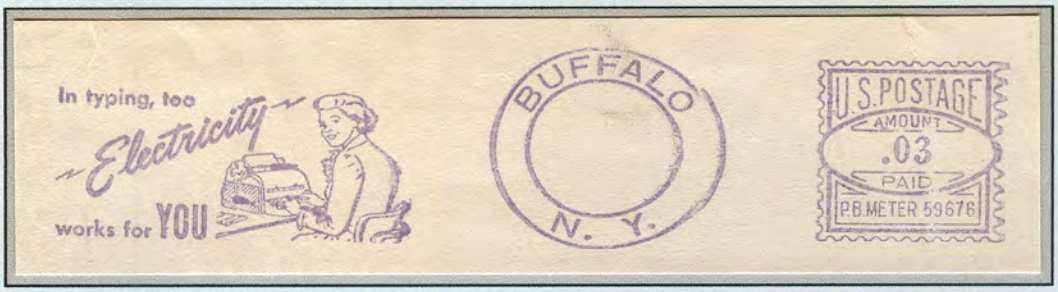
A numeric keypad, part of a standard computer keyboard, is based on the electric calculator 10-key pad. The numbers (0-9) are ordered bottom up and surrounded by operating keys.

A number tools increased the productivity and/or quality, such as: carbon paper, colored typewriter ribbon, removable typing element for fonts (family of characters), and others.

Aerogram (USA - 1981)
-partially shown ►

There was a time offices had a mixture of keyboard based systems what made it possible to learn those new systems easily, one after the other, in just a few years, while typewriting technology changed very little in its starting years.

Fancy Cancellation (USA-15.04.1933) from Briggsdale, Ohio to Lewisburg Man is sitting at desk in front of typewriter typing.



Pitney Bowes model "CVS" (USA)

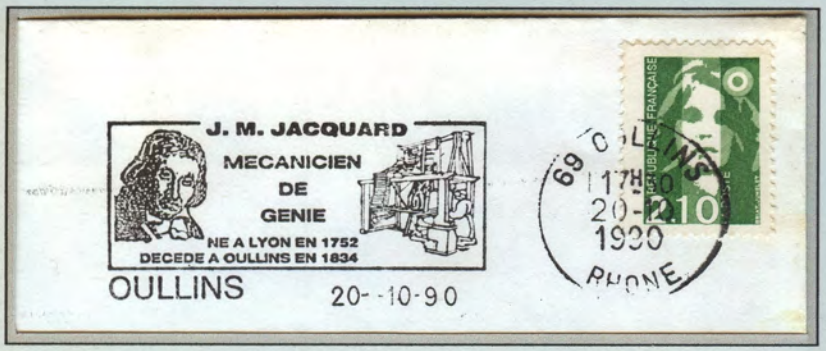
50 years later the electric driven typewriter became common. One century later the computer having powerful word processors programs using nice fonts and laser printers giving better and nicer results.

text: electric typing

◄ *Specimen electronic personalized stamp (France - 2013); designed by La Poste*

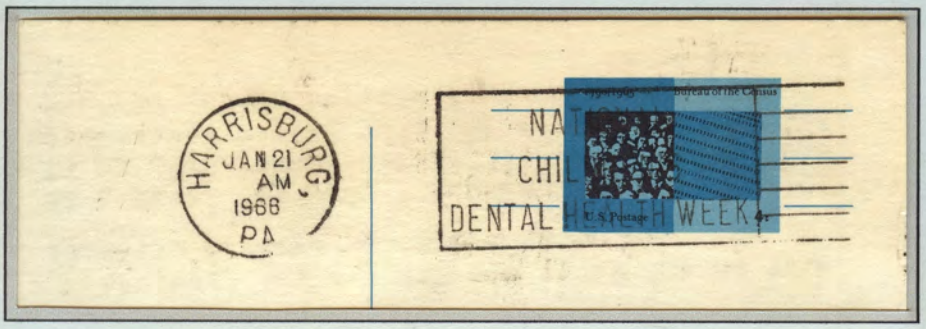
An ergonomic computer keyboard is designed with ergonomic considerations to minimize muscle strain and a host of related problems.

Microsoft "Natural" keyboard: the ergonomics (=design and comfort) becomes more and more important.



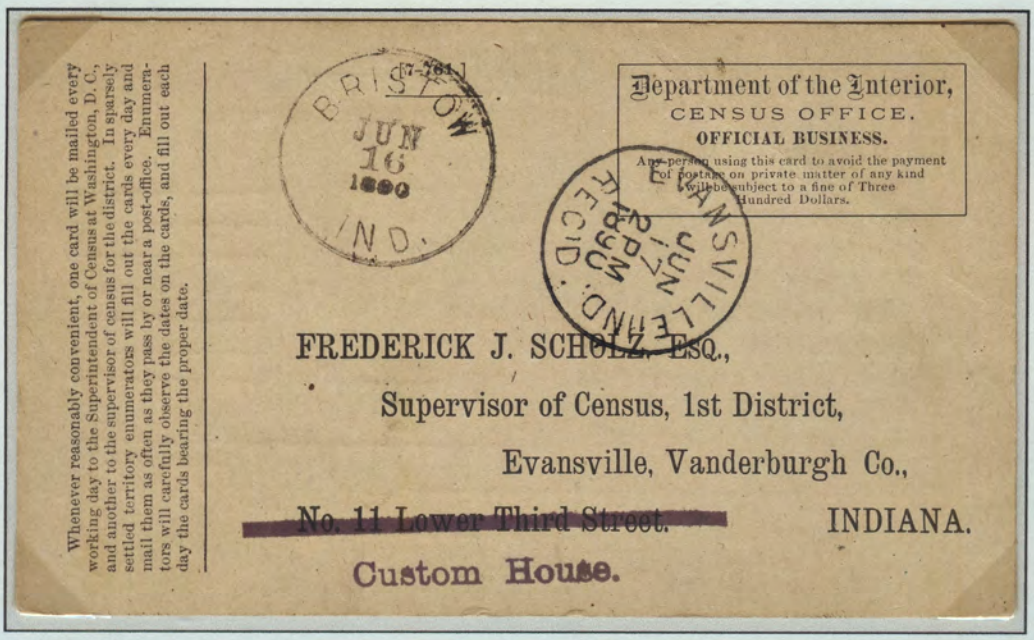
The well-known punch card is an invention of a French silk weaver called Joseph-Marie Jacquard. In 1806 he realized his first industrial automation of a weaving production process. He ran a loom by using plates with holes, punch cards.

Crashed Letter Ballon Monté ***"Le Jacquard"*** *(Paris 24Nov1870 – London 19Dec1870) named after the famous silk weaver. The balloon was crashed near the Scilly Isles to the South of England and the pilot died. Few bags were recovered after the sinking. Stamp was lost (see Ⓡ rebuts) due seawater.* ▶



◄ *Stationery (US); celebrate bureau of census 1790-1965 (only stamp shown)*

Stationery (Romania) : Herman Hollerith (only stamp shown)



◄ *Service card Census office (US -1890); sent free of postage*

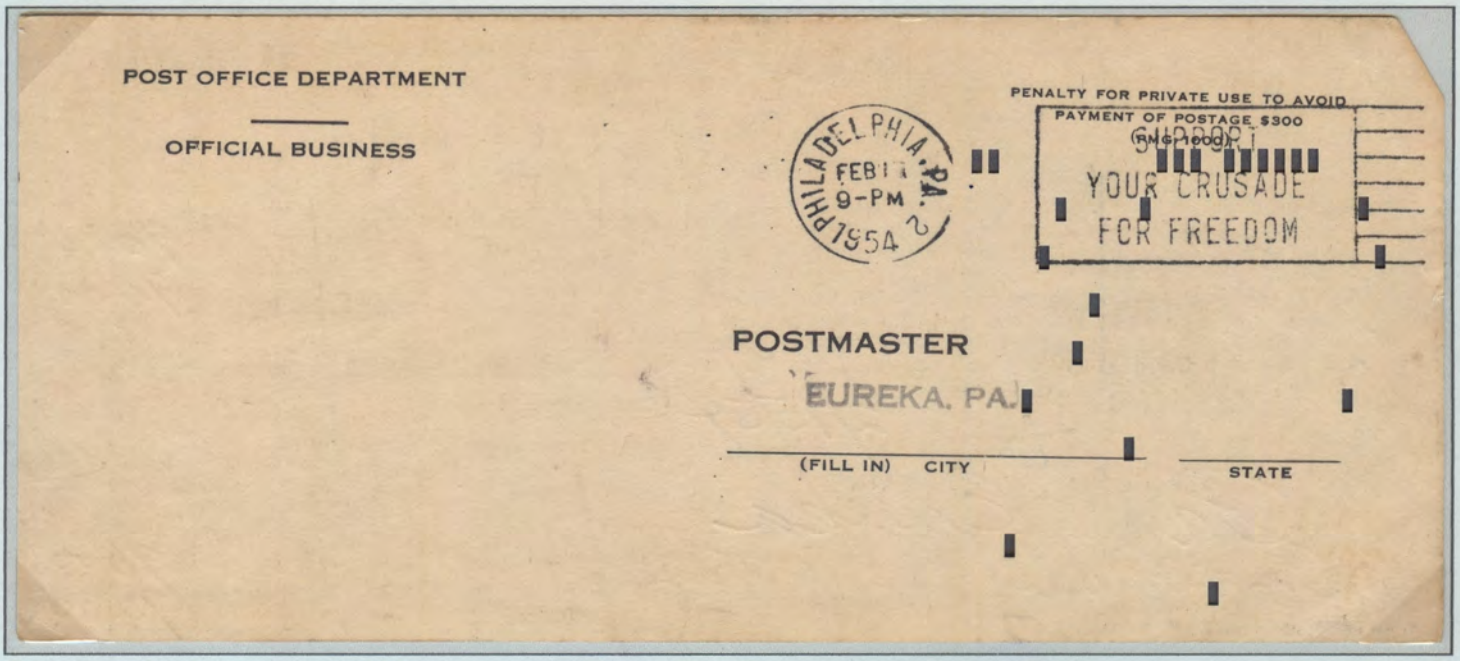
In 1884 Herman Hollerith, special agent of the US Census Bureau, developed his first tabulating counting system based on Jacquard's system. He developed a punch card to be used for the 12th census in the US. Because the one before took 7 years to complete and with additional 12 million people it would take more than 10 years to complete. 43 punch card readers treating 55 million people's data was completed in 6 weeks.

◄ *Francotyp "B" with tall value figures (German Empire) 1927; text Hollerith punch card systems*

Hollerith Tabulating Company became IBM in 1926. IBM's German subsidiary DEHOMAG (Deutsche Hollerith Maschinen AG) came recently into the news for its involvement in the Holocaust; the punch card systems delivered, helped the Nazi regime processing people's information quicker.

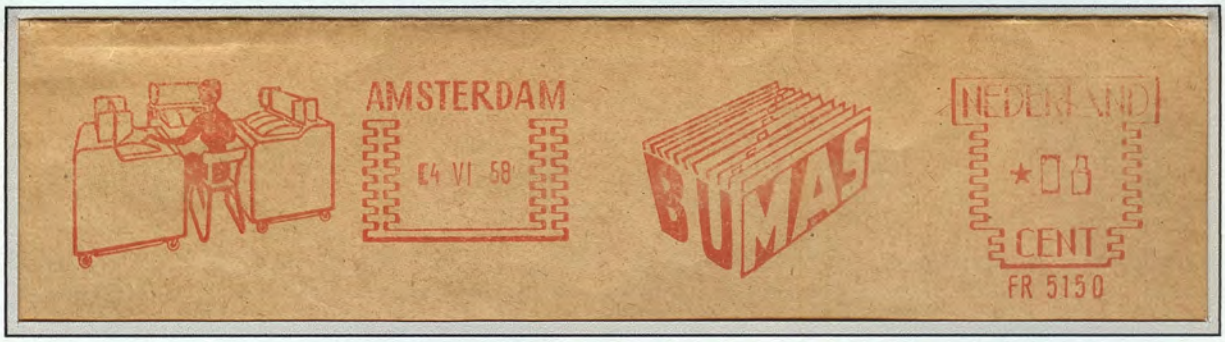
Postalia model (Germany - 1949): 2 Penny mandatory support for suffering Berlin after 2nd World War - ill. Punch card Hollerith Maschinen

The most common (IBM 80-column) punch card measures 187mm by 83mm and typically had one upper corner diagonal cut so that cards are oriented correctly. It contains 80 columns and 12 lines, corresponding with 1 line of 80 characters of data and the punch positions represents characters using the Hollerith-code.



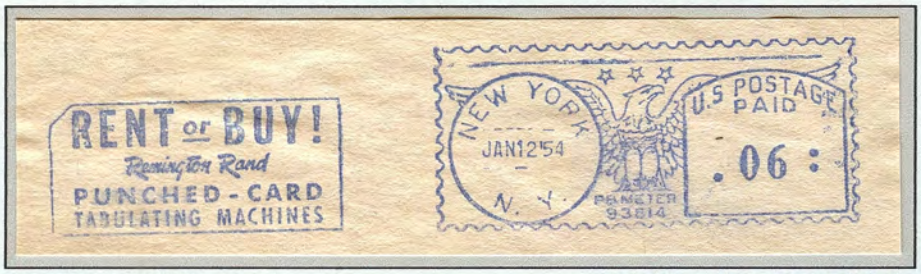
Post office service card - 'penalty for private use' mail (US): sent free of postage. Card format an IBM 80-column

2.3 The soon forgotten punch card.



Francotyp "CC" (Netherlands) punch card reader machines ▶

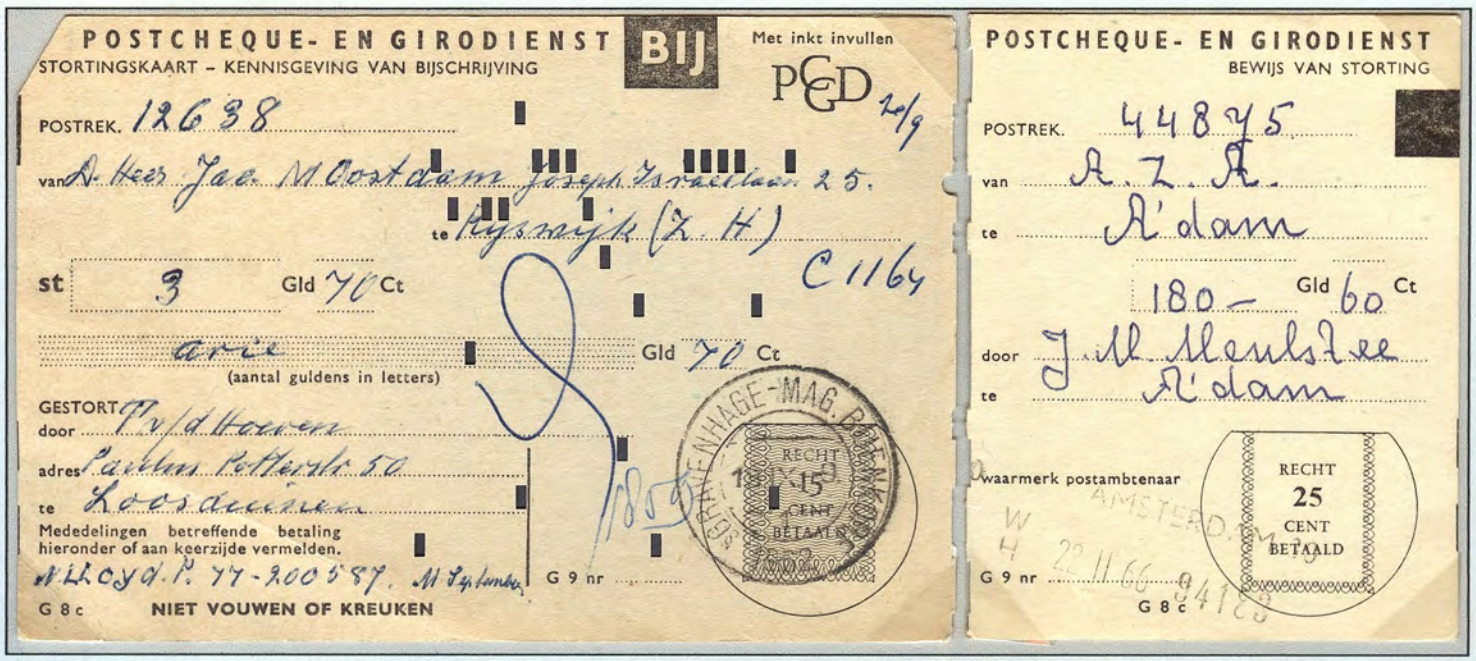
Up to the 1980s data and even programs were read in with this medium thru punch card readers.



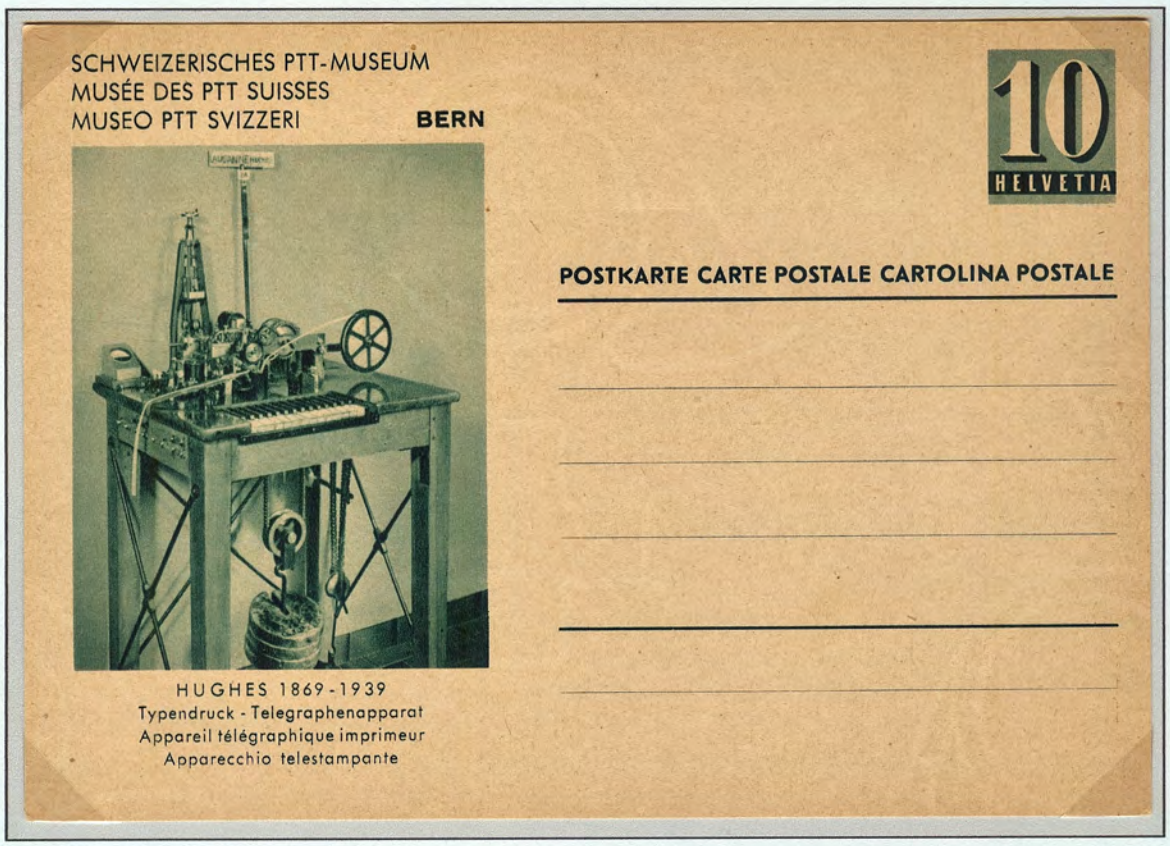
Pitney Bowes (US – 1954) punch card Remington Rand

Punch card reader (left)

High-speed sorters and readers could process up to 650 punched cards a minute.



Deposit card G8c has IBM 80-column format and uses the Hollerith-system. Used from 02 October 1961, for depositing money. Notification description was coded (see punch holes) for automatic processing of the data. Right part, proof of deposit, was send to the payer. There are 7 different versions of this payment card, including denominations for three tax increases. The printed values were appearing alternating on the left or right part. This payment method was no longer used starting on 30 July 1966.



E. Hughes

The paper punch tape is better known from the telex world. The telegraph and newsagents have used for many years a machine, called *telewriter*, an invention of **E. Hughes** (1831-1900) in 1855.

IBM 1621 punch tape machine

Punch tapes have always been used as input and output devices. In the late 1950s when speed became more important and the capacity wasn't sufficient anymore, a switch was made to magnetic tape. It was still in use by the telex users till beginning 2000s especially in the US.

Color proof with notes of color numbers used (France)

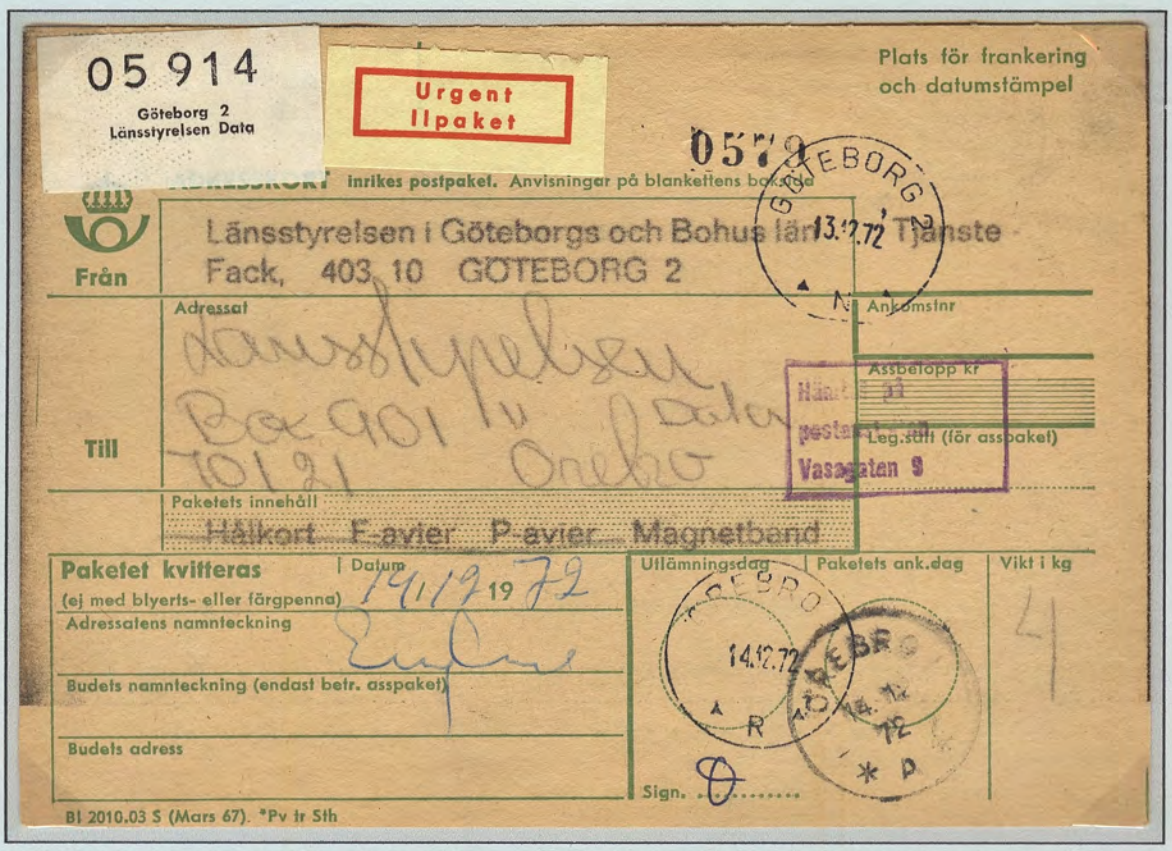
left; IBM 1621 punch tape machine

2.4 The paper punch tape and the magnetic tape.

Magnetic tape was in the beginning only available on a spool. It was for a long time the most used storage medium, especially for backing up and storing programs.

It allowed companies and organizations to store data in a very inexpensive way.

Tapes were portable and could be sent around the world without data loss, but today magnetic tapes are available in cartridges, in which they are better protected against damages.



Official parcel service card for a 4kg package, marked urgent, containing holerith cards and magnetic tapes. Sent 14dec1972 from Göteborg to Örebro

2.4 The paper punch tape and the magnetic tape.

A tape unit unrolls a tape from one spool to another spool, while it can read or write the data or instructions on that tape.

Magnetic tape contains very small magnetic particles put on a plastic carrier (tape). Those particles can be magnetized (storing data) with information.

The speed of transfer can be a few hundred thousand bytes a second, but is considered as too "slow" today.

Stationery cassette post (Egypt); facility for private individuals to send spoken messages on cassette tapes to their relatives and friends.

The first personal computers used the classic music recording cassette as a cheap storage medium to store data and programs. It evolved to tape-streamers for daily and/or weekly computer backup.

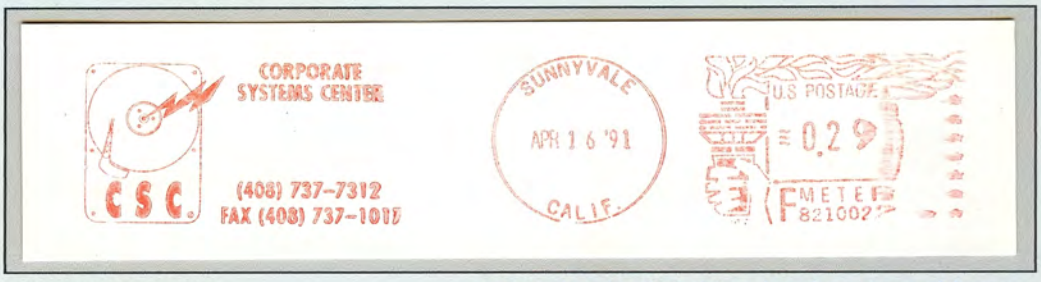
2.5 From disk to floppy, from CD to Cloud.

A memory device, such as a floppy disk or a hard disk is covered with a magnetic coating on which digital information is stored in the form of microscopically small-magnetized needles. Data is read and written by a disk drive that rotates the discs and positions the read/write 'heads' over the desired track(s). The latter radial movement is known as 'seeking'.

▲ Removable disks ▼

Pitney Bowes "6300 series" (Germany)

Removable disk



Friden 9258 (USA)

internal sight disk drive, heads on moveable arm

Today billions of bits of data can be stored on those disks. The **removable disks** are replaced by fixed redundant inexpensive or independent hard drives (RAID). This provides high availability and secured data access protected by system microcode.

5.25 inch diskette; flexible cover (protective jacket) and a capacity of 360KB to 1.2MB

A **floppy drive** for **diskettes** was standard in every personal computer with a hard disk till 2005. A floppy disk can store data. A floppy drive can be recognized by a covered slot at the front of a PC, where de diskette can be brought in or later removed. By 1996, there were an estimated 5 billion floppy disks in use.

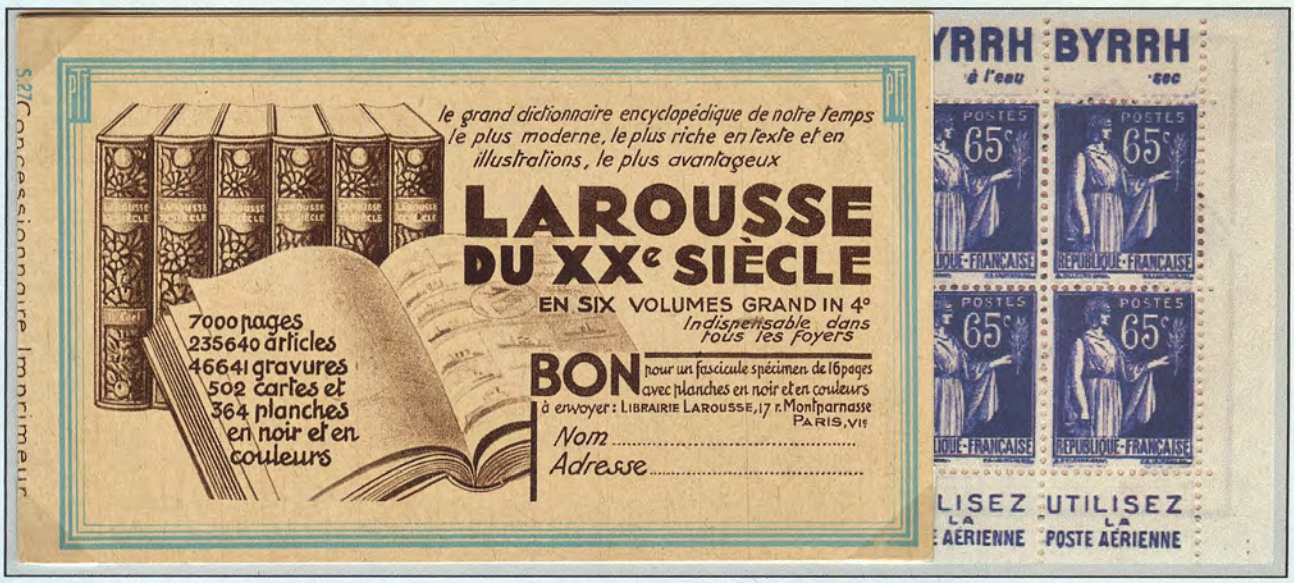
3.5 inch diskette; hard cover (better protection) and a maximum capacity of 1,44MB.

2.5 From disk to floppy, from CD to Cloud.

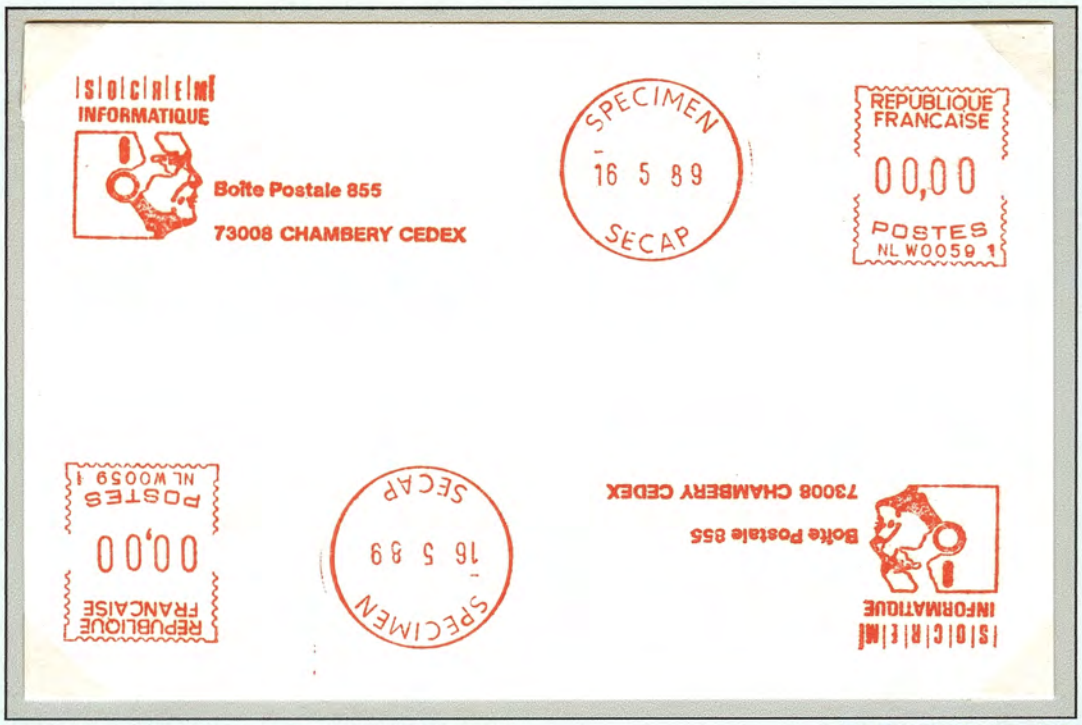
May 16, 1960, **Arthur Schawlow** and Charles Townes outlined the working principles of the laser beam technique, which was derived from the microwave technique. Finally the laser technology expanded continually in the world of science, medicine, industry, and entertainment resulted in different fiber-optic compact disks.

Francotyp "Cm7000/10000" (Sweden) A CD-ROM disk can store 250.000 A4-pages

Today CD-ROM (**R**ead **O**nly **M**emory), CD-R (**R**ecordable), CD-RW (**ReW**rite) and DVD (**D**igital **V**ideo **D**isk) are often used for music, video, software and encyclopedias.



A compact disk can easily contain an encyclopedia as Larousse with all its articles and images, up to 650 megabytes (6500 x 2^{20} bytes; being 650 x 1048576 bytes or about 250.000 A4 pages text) of data.



Meter Stamp Specimen type SECAP (France)

5.25 inch floppy disk

The floppy disk or flexible magnetic disk revolutionized computer disk storage for small systems and became ubiquitous in the 1980s and 1990s in their use with home computers to distribute software, transfer data, and create backups and archives.

USB flash drive, symbol USB in tab (right)

Internet

Archives

Cloud

Today the traditional storage have now been superseded by USB flash drives, external hard disk drives, CDs, DVDs, SD cards and became invisible by computer networks, internet or in the Cloud.

Evolution of different media; punch card, tape, Floppy, CD to flash drive and SD card

The printing (r)evolution started long before the computer age, in 1436 Gutenberg's work on the printing press, spread rapidly across Europe thanks to the high quality and relatively low price, always searching for quicker and more efficient way of reproducing text and image.

Word 'printer' derived from printer profession

Francotyp "Cc" (Belgium): missing town + date mark

Carbon paper

Commercial impact and regulations forced companies to fulfill more and more paperwork. First written on preprinted paper, and then later fully typed on typewriters, using all kind of tools to reproduce more and quicker, like carbon paper twisted between two sheets of paper copying the text easily.

Preprinted Paper ▶

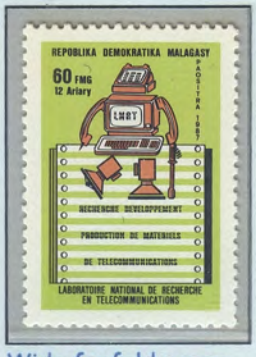
Also stencil technique (spirit duplicator) often used when high volumes were needed and typewriters were involved.

Strike post from Great-Britain (8 Feb. 1971); it was approved in that period to special private postal services to produce and sell stamps; stamp produced by the stencil technique.

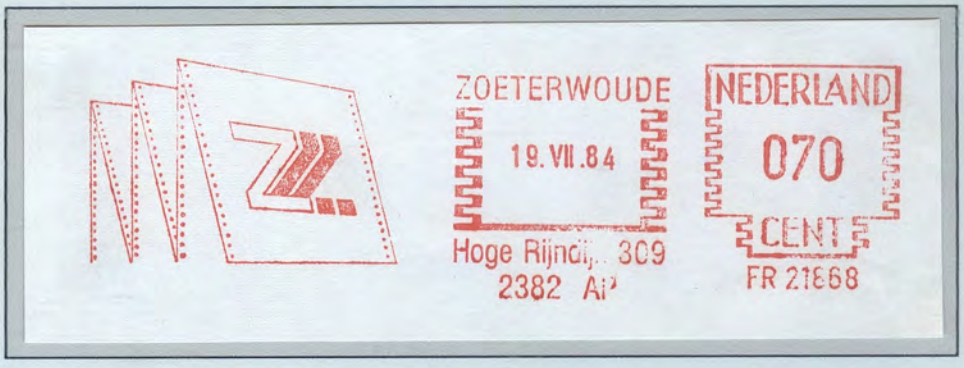
teleprinter

SECAP prefix "NE" (France) Typical computer with printer setup; printing on fanfold paper

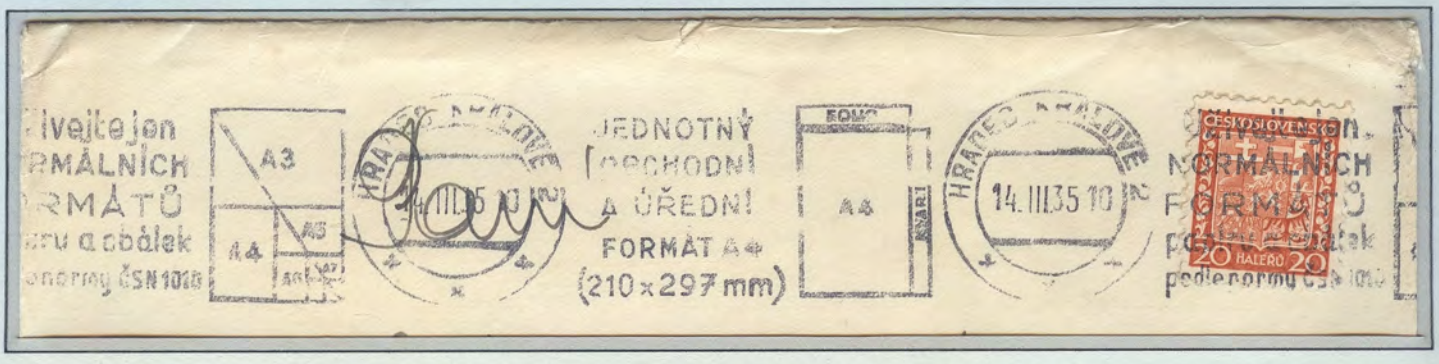
A printer is an output device that started as a "teleprinter" used in the telex world. Text or drawings coming from a computer are printed on paper.



Wide fanfold paper



In the early years wide fanfold paper was most commonly used with impact printers like line and dot matrix printers. The continuous paper with edge perforations is moved through the printer with sprocket wheels or toothed belts.



Today all European laser and inkjet printers are using standard paper sizes like A4 and A3. A4 (210 mm x 297mm) is part of an official metric standard. It was set in 1975 and is based on a German standard originally from 1922. The key feature of this paper size is that A4 is half the size of A3, A5 is half the size of A4.

Since introduction of e-readers and tablets more and more people are working paperless or greatly reduced it.

Line printer quality

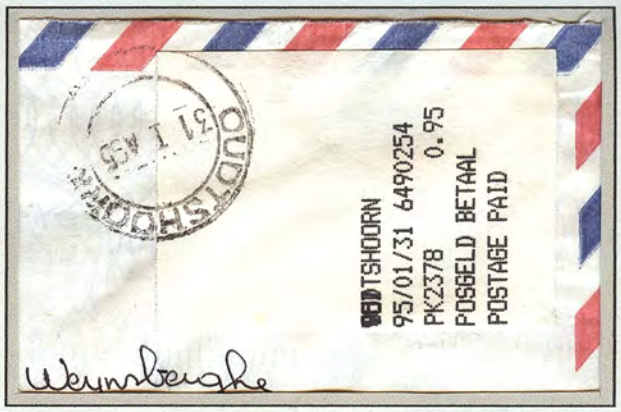
Fragment block (Belgium) 3D-print out in plastic

3D-printers are the next printer generation. They work like inkjet printers by extruding small beads of material (like plastic, metal) which harden immediately into forms created with a computer aided design (CAD) packages.

2.6 All the differences in printing.

▲ *dot-matrix printers* ►

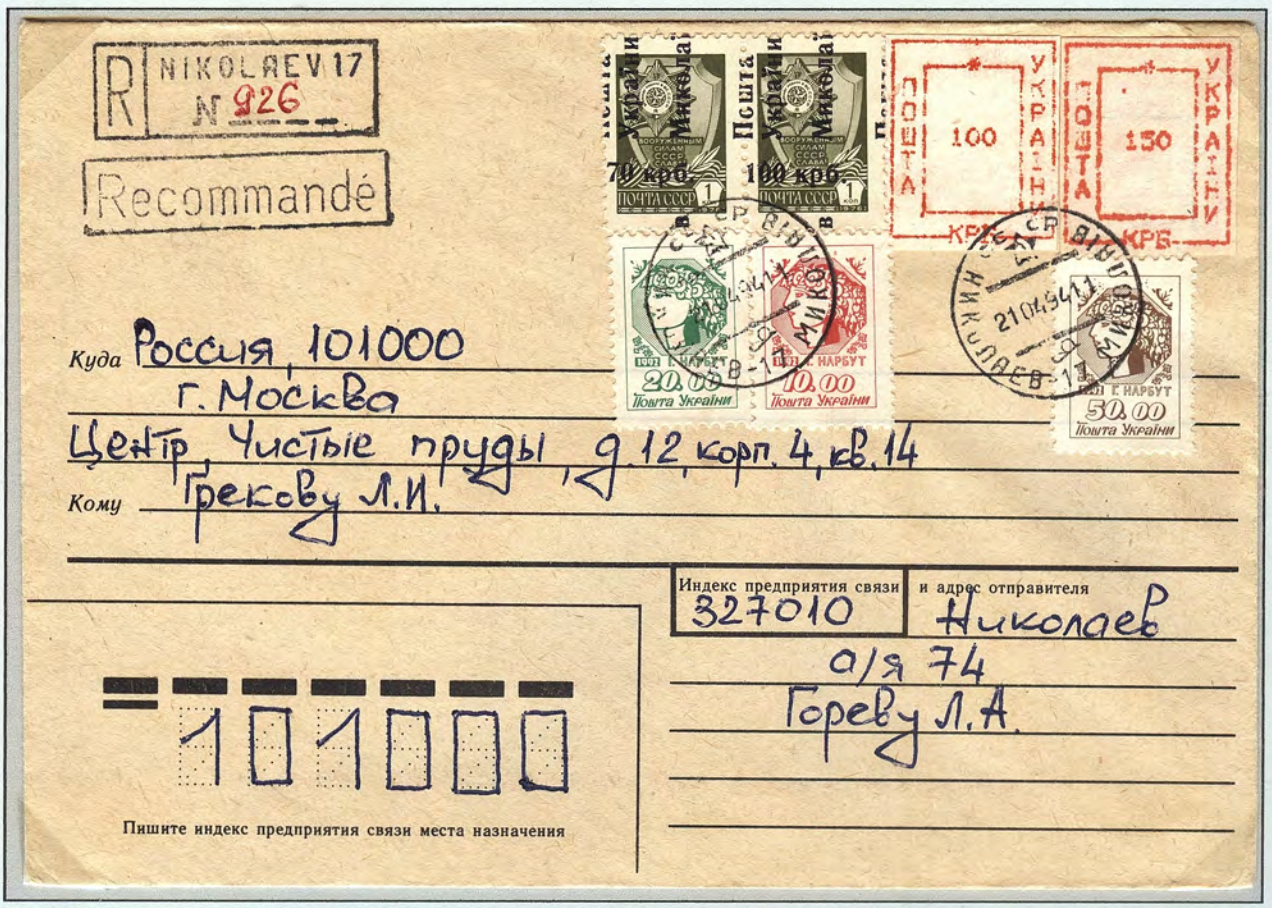
▲ *pre-printed registered label (Israel): text printed with a 9-needle dot-matrix printer using purple ribbon.*



white dot-matrix printer label on letter from Oudtshoorn near Cape Town (South-Africa)

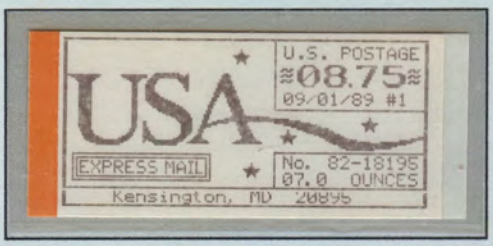
Dot-matrix printers have a vertical column of up to 48 small closely packed needles or pins each of which can be individually forced forward to press an ink ribbon against the paper.

The print head is repeatedly scanned across the page and different combinations of needles activated at each point. Dot-matrix printers are noisy compared to non-impact printers like laser or inkjet printers.



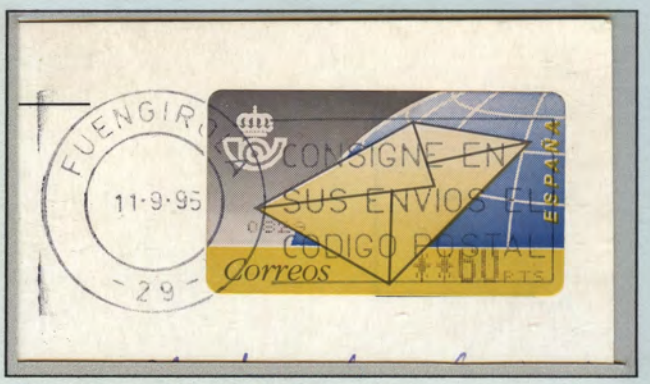
The Nikolaev (principal town of Ukraine) so called computer stamps are printed with a common 9-needle dot-matrix printer. Due to a shortage of stamps in the period of 1992-1994, because of the independence of Ukraine, a lot of those regional (local) stamps were produced. They exist in black and red printed postage and with different values.

Print out on 1st Class stamps (Great-Britain) of printer test of a self-service payment NCR VK80 thermal printer widely installed in post offices.



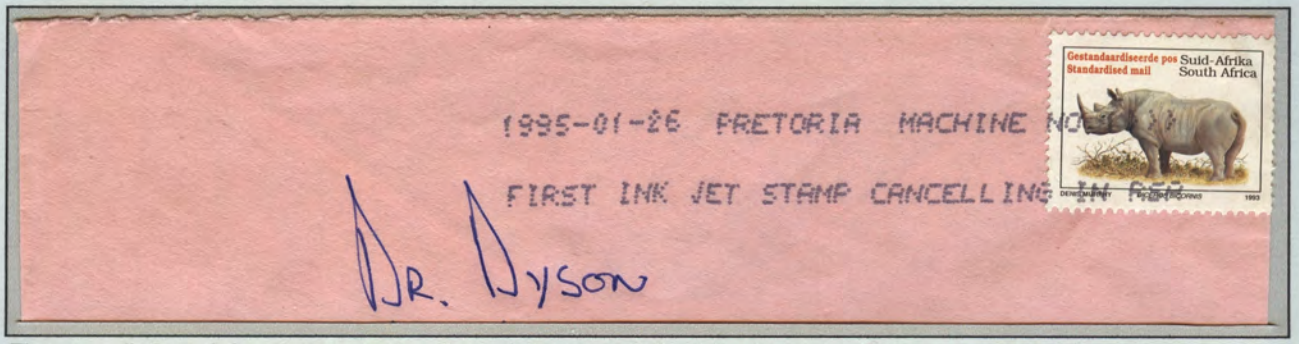
Thermal transfer print used at the 'Autopost' experiment, a self-service postage vending machine. The stamp is printed at selling time. Tests have taken place in the congressional post office in Washington, D.C. and Kensington. After a lot of problems the experiment was cancelled.

A thermal transfer printer uses thermal wax ribbon or paper. During the printing, paper or ribbon is heated on those spots where printing is wanted. These printouts can be used in environments of higher temperatures.



Thermal transfer print (Spain) example

Thermal printers are cheaper and use continuous paper and ribbons which cost more.



The cancellation of the stamps on the above letter was realized by the cancellation machine JAIME 1000SA having a build-in inkjet printer, that can automatically print current timestamps, and 25 different slogans (max length of 140mm). Printing speed is about 4 meter/sec of cancellations.

Inkjet printers are non-impact, electronically driven printers that use hundreds of tiny print head nozzles that each eject, by thermal pressure, a single drop of ink on a surface to form text or images. Technical research in ink drying and sharpness has given them high availability and reliability.

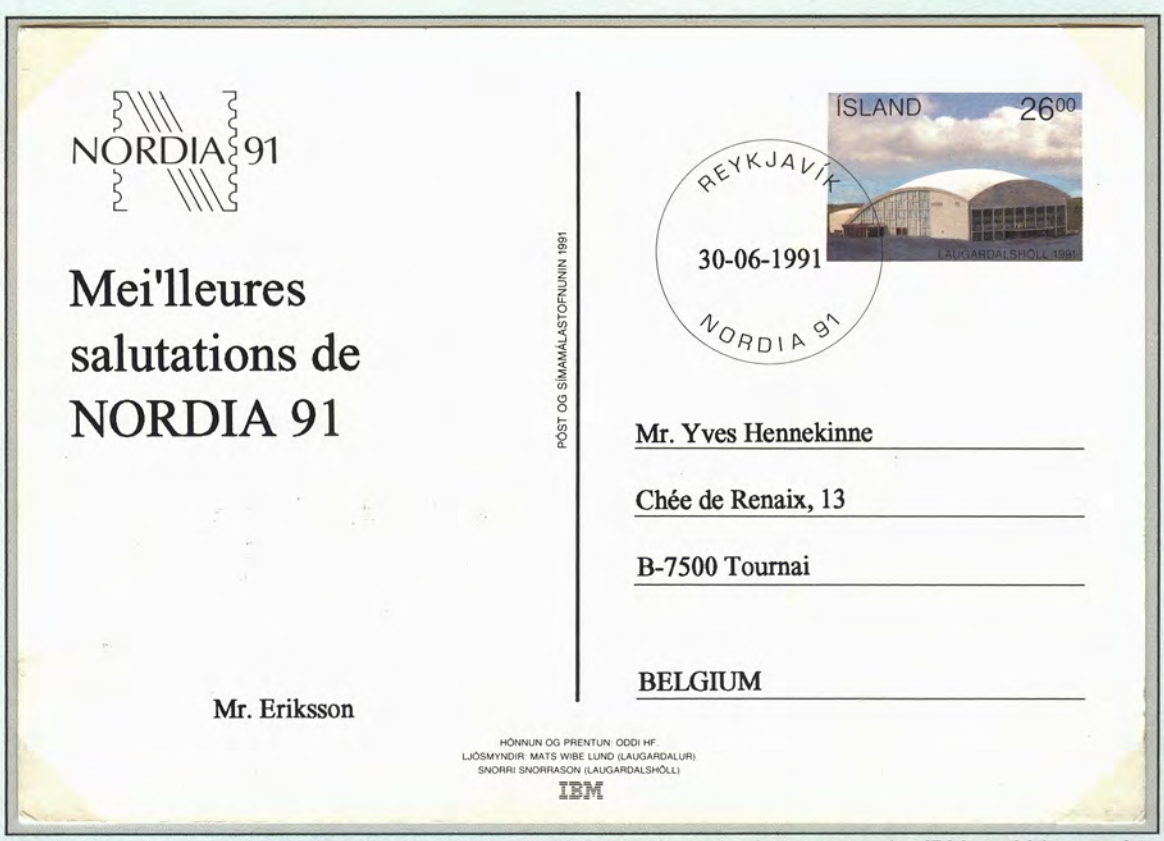
The numbers (every fifth stamp) on those coil stamps (Germany) were printed by an inkjet printer. Before those numbers were printed by traditional printers.

Plotter (detail)

A plotter is a device that uses one or more ink pens that can be raised, lowered and moved over the printing media to draw graphics or text. Combinations of horizontal and vertical movement are used to draw arbitrary lines and curves in a single action, in contrast to printers, which usually scan horizontally across the page.

In 1970 the Dutch Post administration designed stamps with very complex drawings and were fully drawn by a plotter driven by data stored on paper punch tape. This technique is to eliminate duplication, as the complexness discourages forgers.

A laser printer uses laser beams to produce an image or text on a rotating selenium imaging drum. The developer drum transfers toner from the toner bin to the charged areas of the imaging drum, which then transfers it onto the paper into which it is fused by heat. Toner is dry ink powder, generally a plastic heat-sensitive polymer.



*During the stamp exhibition **Nordia 91** a network of terminals and printers setup by IBM could be used to send the above stationary in an automated way. Date of mailing was printed by a central laser printer in the preprinted cancellation, together with an address and message chosen by the sender.*

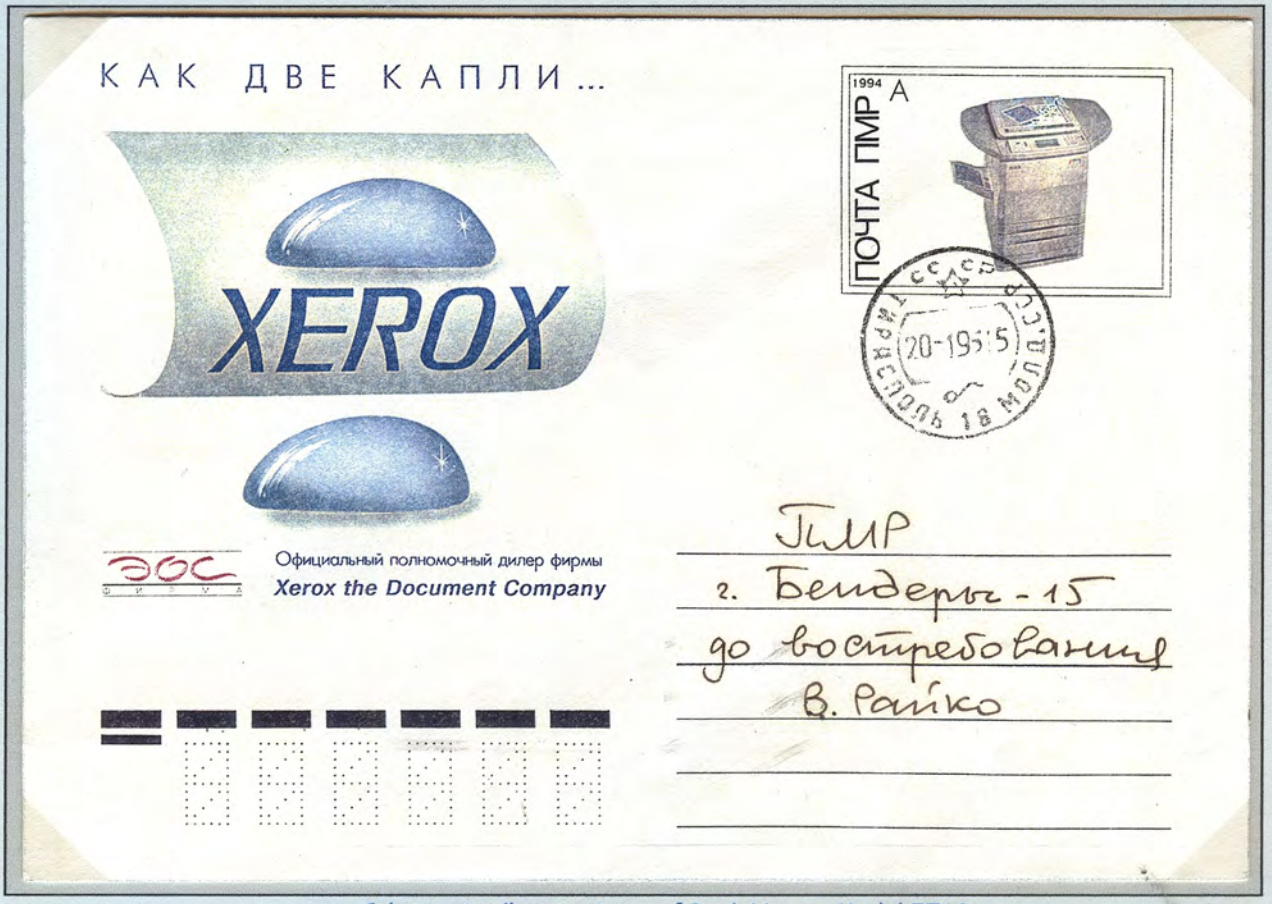
*Letter with 3 different colored stamps; 5c blue, 10c red and 40c yellow with Papal emblem in black, sent as **"PD"** (Postage paid to destination) from Rome (Papal States) on 10.01.1870 via Saint-Michel-de-Maurienne, France (see blue transfer cancel E.-PONT. St. MICHEL - 13JANV1870) arrived in Knowle, Great Britain on 14.01.1870.*

Represent the 4 basic colors of every printed image.

CMYK

Digital Printing

Today's laser and inkjet printers print in colors. Most of the entire spectrum or gamut of colors can be reproduced with just the four process ink colors (CMYK); Cyan (blue), Magenta (red), Yellow and black (K stand for *'key'*; traditional word for the black printing plate). Small dots of these colors are printed at different angles to create the printed image.



Color copier/laser printer of Rank Xerox; Model 5760

In the 1960s till 2000, the Xerox Corporation held a dominant position in the copier/laser printer market. In 1969 Xerox engineers developed a laser beam to "draw" an image directly onto the drum before printing it.

◄OCR font
flam cancellation ►

A tool for electronic identification and digital encoding of printed or handwritten characters by means of an optical scanner and specialized software is OCR (Optical Character Recognition).

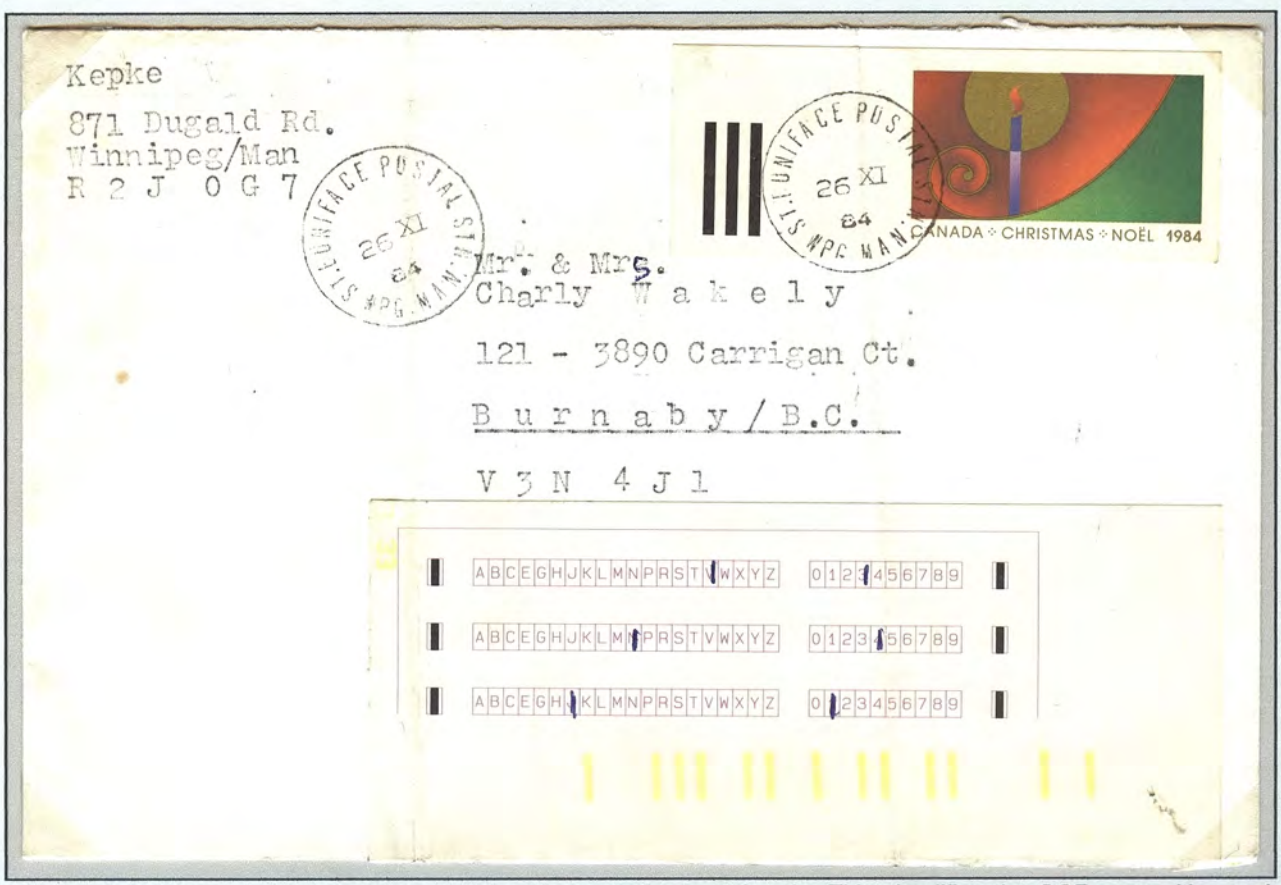
Magnetic Ink in combination with OCR

Shift colors

Special magnetic ink is used for printing banknote numbers in OCR character format (font). This way computers can check the banknotes for forgery and where and when used.

In the same way ticking boxes with a black pencil can help a computer optically to read or interpret data.

Optical ticking with a pencil



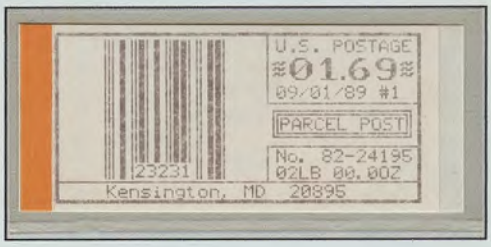
OCR sticker (Canada): allow senders to tick with a pen the postal code. This simplifies the OCR recognition and quicker sorting.

2.7 Coding with bars.

In 1952 Mr. N. Woodland and Mr. B. Silver received their patent for barcodes. In 1974 a modern price scanner was first used it in the U.S. food industry.

◄ *First stamp booklet with barcode (type UPC - A) issued by US Postal in 1987*

Type UPC-E used for the Autopost Experiment; a self-service stamp machine. The stamp was printed at the moment it was sold. It was tested in Washington DC and Kensington. After a lot of problems, like disappearing ink the experiment was stopped. ►

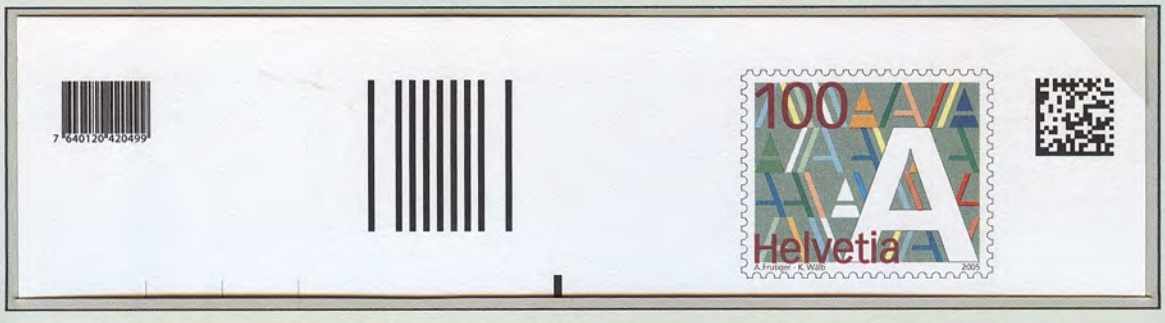


Today, all products sold are marked with a barcode called a Universal Product Code, or UPC.

Europe uses a derived version of the UPC called EAN-13 (European Article Number); an extra check-flag was added to it. The EAN replaced the UPC in the year 2005.

▲Barcode in border (type EAN-13)

Each code typically contains a printed horizontal strip of vertical bars of varying widths, groups of which represent decimal digits. Bar codes have a leading "quiet" zone, a start and data character, a check digit, stop character and a trailing quiet zone. Check digits are used to verify that the number has been scanned correctly.



Stationery (Switserland) with 3 types of bars; EAN-13 (left), 2-Dimensional CP-code (right) and sorting bar code (center)

Meanwhile 2 dimensional barcode are introduced to have access to more data. QR-code is specially designed for the automotive industry in Japan.

QR-code (Quick Response)

Meter stamp printed in dark blue instead of red for better automatization (Dresden, Germany Privatpost - Post Modern - 2012)

QR-code scan with smartphone

But QR-code is also very popular outside the automotive industry and now used in consumer advertising to allow smartphone application to route to internet information.

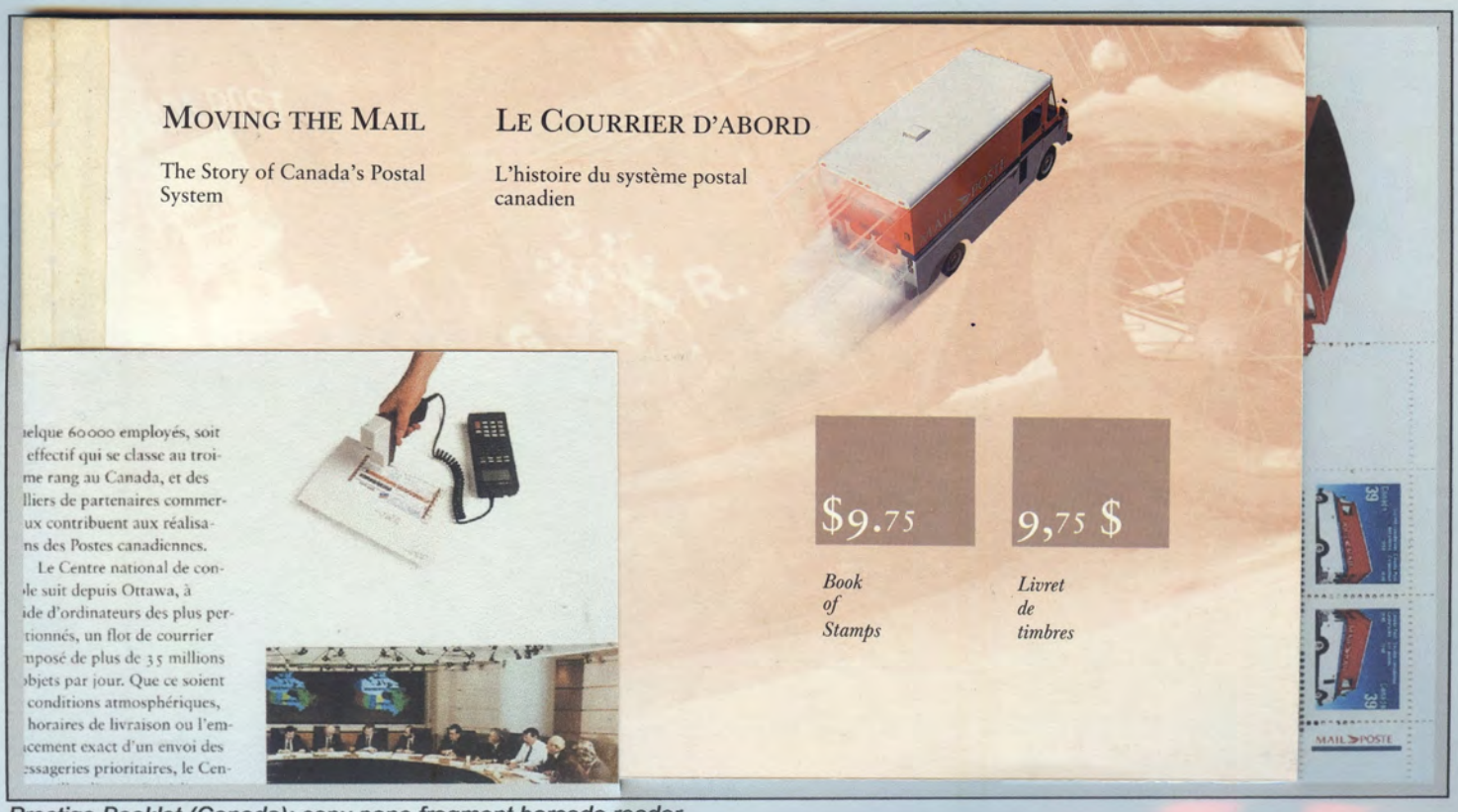
International Reply Coupon (Norway), barcode type CODE-128 used in every country by the treaty of world post signed in Seoul in 1994. A POSTNET barcode that consists of 62 bars with beginning and ending frame bars and 5 bars each for the letters of country code (NO) and digits of beginning and ending of validity, serial number and 074=IRC.

Large amounts of text (860 ASCII characters) and data can be stored securely and inexpensively when using the Data Matrix barcode, which is a very area efficient 2D (two dimensional), barcode using an unique perimeter pattern that helps the barcode scanner determine the cell locations. The cells are made up of square modules. Data Matrix barcode can encode letters, numbers, text and actual bytes of data; it can store and pass just about anything.

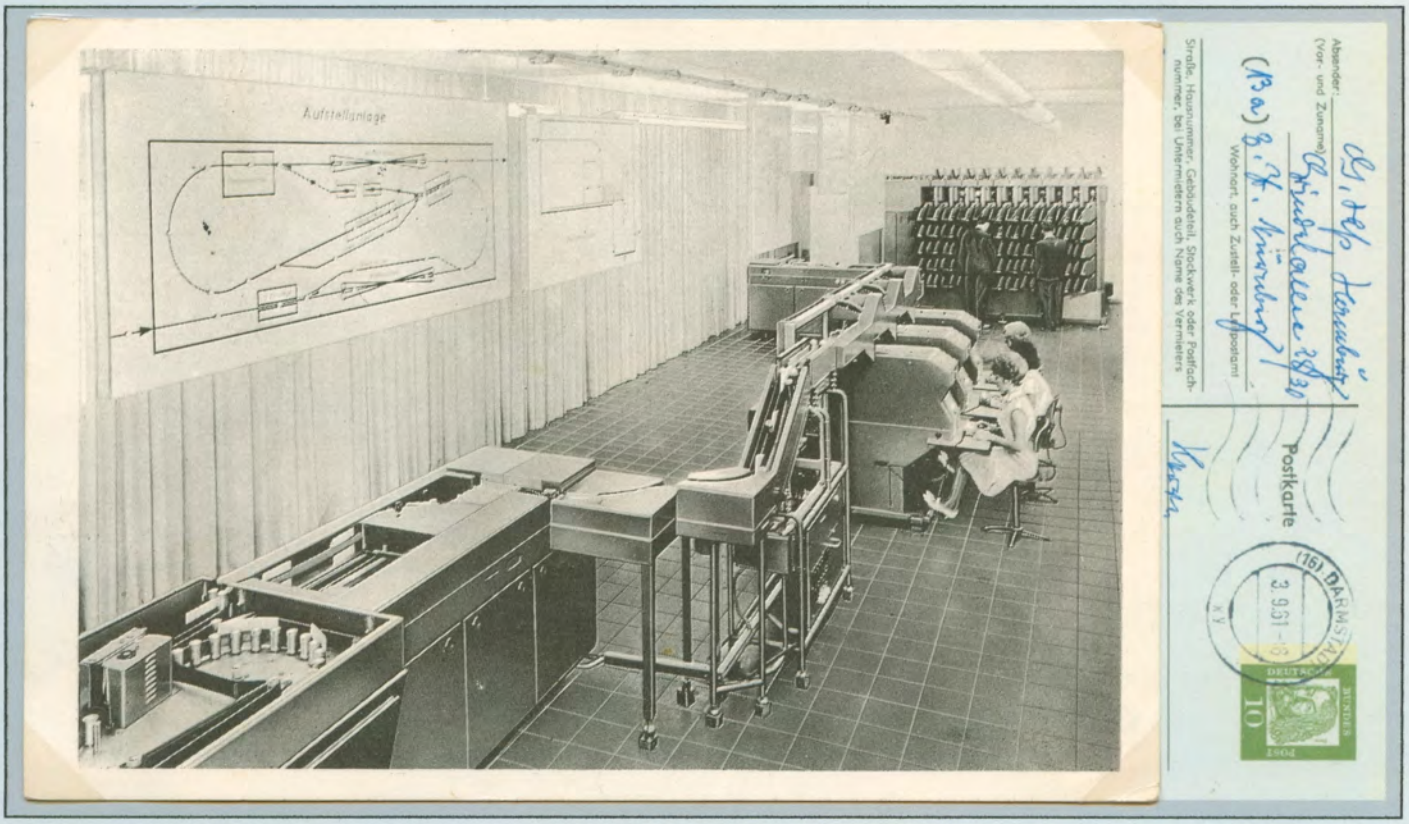
Mid October 2001 the Italian Post administration introduced a new self-adhesive label delivered by Tecnost (group Olivetti) containing a bi-dimensional barcode type Data Matrix. The Belgian post administration didn't have that technology, a barcode type CODE-128 was placed to send the registered mail smoothly.

◄ *vignette scan barcode registered (France); ill. barcode reader with red laser.*

Barcode readers usually use visible red light to read the code and interprets it either through software or a hardware decoder. When read it is send to the application for processing.

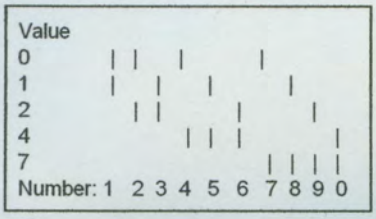


Prestige Booklet (Canada); copy pane fragment barcode reader.

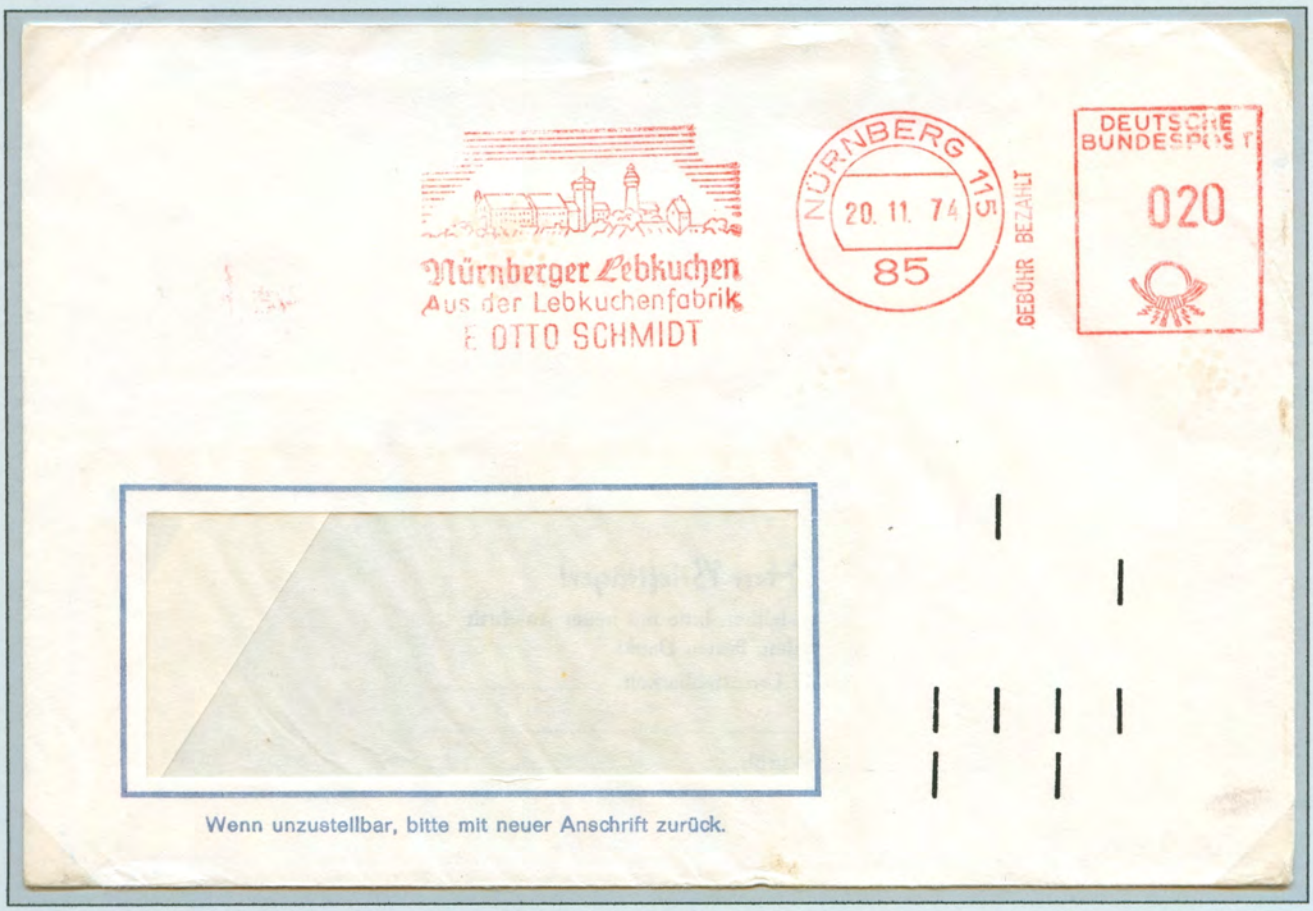


German postal letter sorting using the "Matrix Code II" came into general operation in 1965. The letters were provided for the preparation of the mechanical sorting with the coding set by the staff up to 5000 letters per hour.

Stationary issued for "Commissioning of the first automatic / letter-sorting of the German Post / Manufactured by the company Siemens & Halske", 31.05.1965 in Pforzheim illustrated with a stylized model of a spiral and a wrong Matrix Code II encoding avoiding mismatching with real coding.

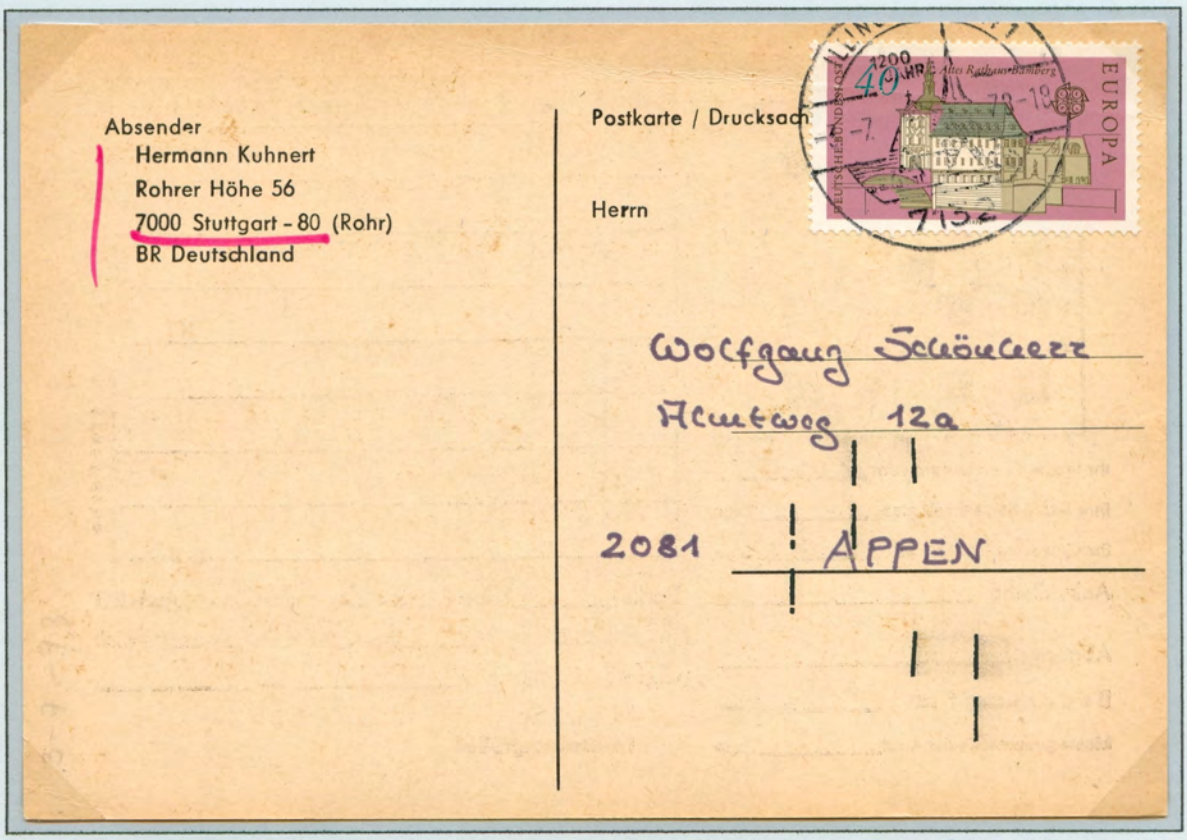


The code consists of lines in four columns (from left to right four digits of ZIP code) with 8 mm spacing of five lines (top to bottom), the values 0, 1, 2, 4 , 7 In each column , two lines must exist (more or less printing error) and it is the sum of the values. For example: 0 +1 = 1, 2 +4 = 6, 1 +7 = 8, etc. 4 +7 = 11 is regarded as zero.



Letter send from Nürnburg: code representing 0405 or 5040, which point to internal tray of the sorting machine.

The wet printed film was made of magnetizable or luminescent paint for automatic recognition, printing color (black, white) bars as a barcode on the address field of the letter. The barcode inkt was secured by a 160°C heat.

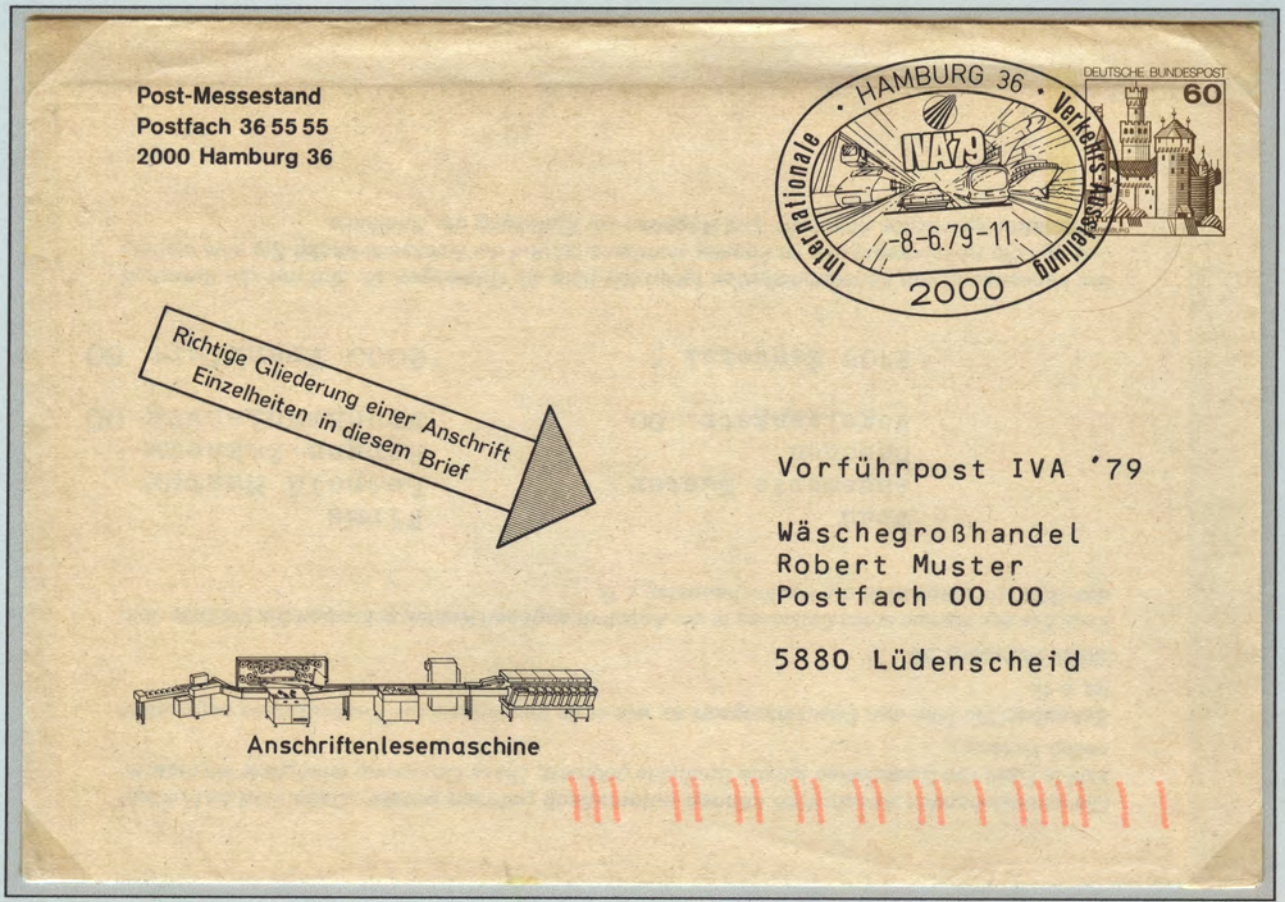


Letter send from Stuttgart: code representing 3140, which point to internal tray of the sorting machine.

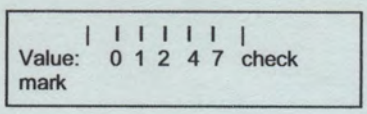
Often the matrix code on the lettre represented internal trays of corresponding city parts or even streets.

Letter from Stockholm to Älvängen (Sweden): bar code printed in white representing 5-digit 44600, small 0 next to code represents de code place.

Other countries like Sweden took over de same techniques. Also in Germany codes were printed in white sometimes.

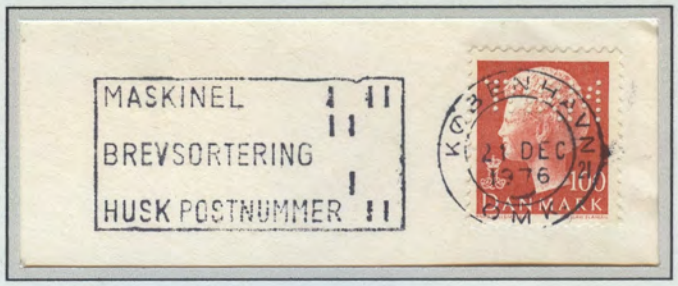


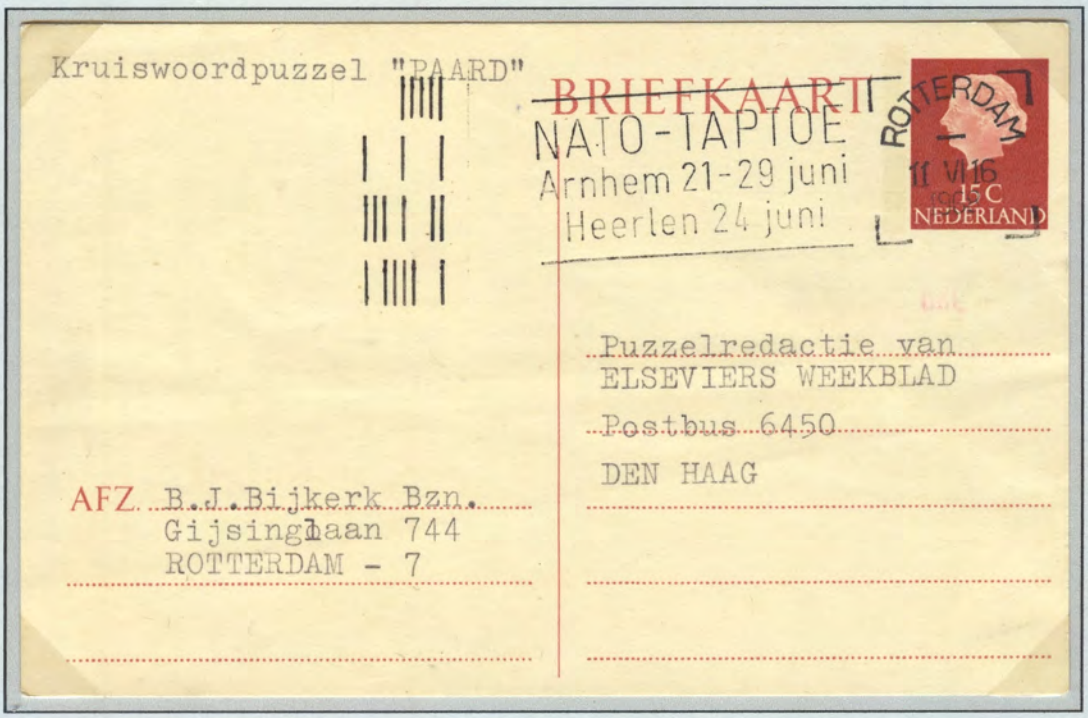
Printed to order (Germany) from Hamburg to Lüdenscheid: code representing 0885 9, left to right code reading. Value 9 points to internal tray or city area. Code gaps represent the value eg: IIIxx = 4+7 =0 ; IxIIx = 7+1 =8



From 1976 the "linear screening" was introduced, and first printed by mechanical printing units of ribbons, later with inkjet printers were applied. There are about a dozen linear code formats.

First-generation machines read the city/ZIP Code of typed addresses to sort letters. Mechanization increased productivity. By the mid-1970s, more efficient methods and equipment were needed if a postal service was to offset rising costs associated with growing mail volume. By end 1970s development of better OCR and expanded ZIP Code was introduced to reduce the number of manual mail piece handlings.





◄ *Barcode (Netherlands - 1968); from 1961 till 1981 a barcode next to the main cancellation was used for mail from Rotterdam to 64 main cities. There are 4 code blocks; lowest 2 code blocks contain the city, the uppermost 2 code blocks contain the code machine. The coding in the code blocks changed a few times in all those years. From 1977 the city code expanded so that the Netherlands could be completely served. In May 1981 the system was stopped and replaced by CMC-7 coding systems.*

2 stamps and a stationary with integrated barcodes (Switzerland); issued on 19 January 1993, to improve the mechanical sorting of letters. The barcodes are constructed with 16 to 34 colored bars over 2 cm on the right side of the stamp. The barcode reader BML4/BR, delivered by Schrack Aerospace of Vienna, recognizes the 60 Rappen (B-post) stamp on its 16 bars/2 cm and the 80 Rappen (A-post) on its 18 bars/2 cm.

Test letter used in the CFC (culler-facer-canceller) installed in Tours Centre de Tri in the period October 1982. Fuzzy cancellation caused by multiple use of the training post. Cancel of first generation with Toshiba logo. Number 850: 8 stand for country France, 50 represents type of envelope and paper used. Stamps pre-printed vertical for testing this type of sorting machines.

In 1973 the company Toshiba (**TO**kyo **SHIBA**uda limited - Japan) delivered sorting devices to the French post administration; 77 installation as a start. In 1991 all sorting centres were equipped and were able to sort 25.000 items per hour.

Test mail from the company TOSHIBA, passed in Rennes Centre de Tri for testing purposes. Number 813: 8 stand for country France, 13 represents type of envelope and paper used. For simulating real mail sorting, all kind of sizes, colours, and different paper quality was tested. Stamps are specially pre-cancelled with phosphorescent bar for use in this type of sorting machine. This enables that the letter is always presented in the same disposition. Stamps pre-printed vertical for testing this type of sorting machines.

2.7 Coding with bars.

The barcode (type CMC7) at the bottom of a letter is generated and printed automatically and is a translation of the postcode on the letter.

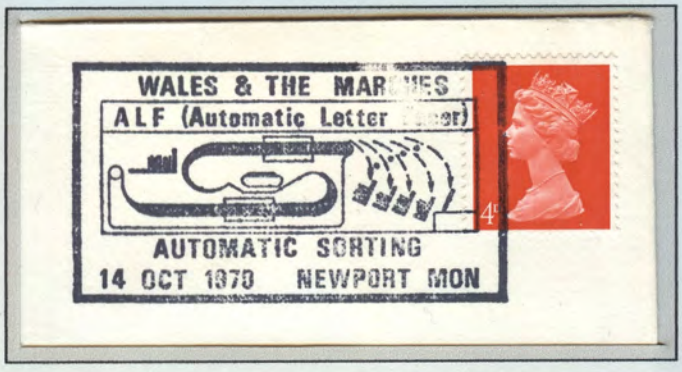
Small grey circular or diamond shaped spots on Machin (Great Britain); Mail-test markings that are applied to the faces of envelopes in tracking mail pieces during a mail test. Some of them happened to fall on the stamps affixed.

In most of the cases handwritten or printed zip codes can be read automatically by sophisticated OCR-software available in powerful sorting systems. An operator will handle zip codes that couldn't be validated. But sometimes it can go wrong…

*The zip code on the letter was misinterpreted by the OCR-system of the sorting machine and translated into a wrong bar code. Due to that the letter was sent to the wrong destination (St. Sauveur en Puisaye). The letter was sent to the correct city after marking it with the postmarks **FD** (Fausse Direction). It was canceled again by the receiving post office and the bar code was canceled*

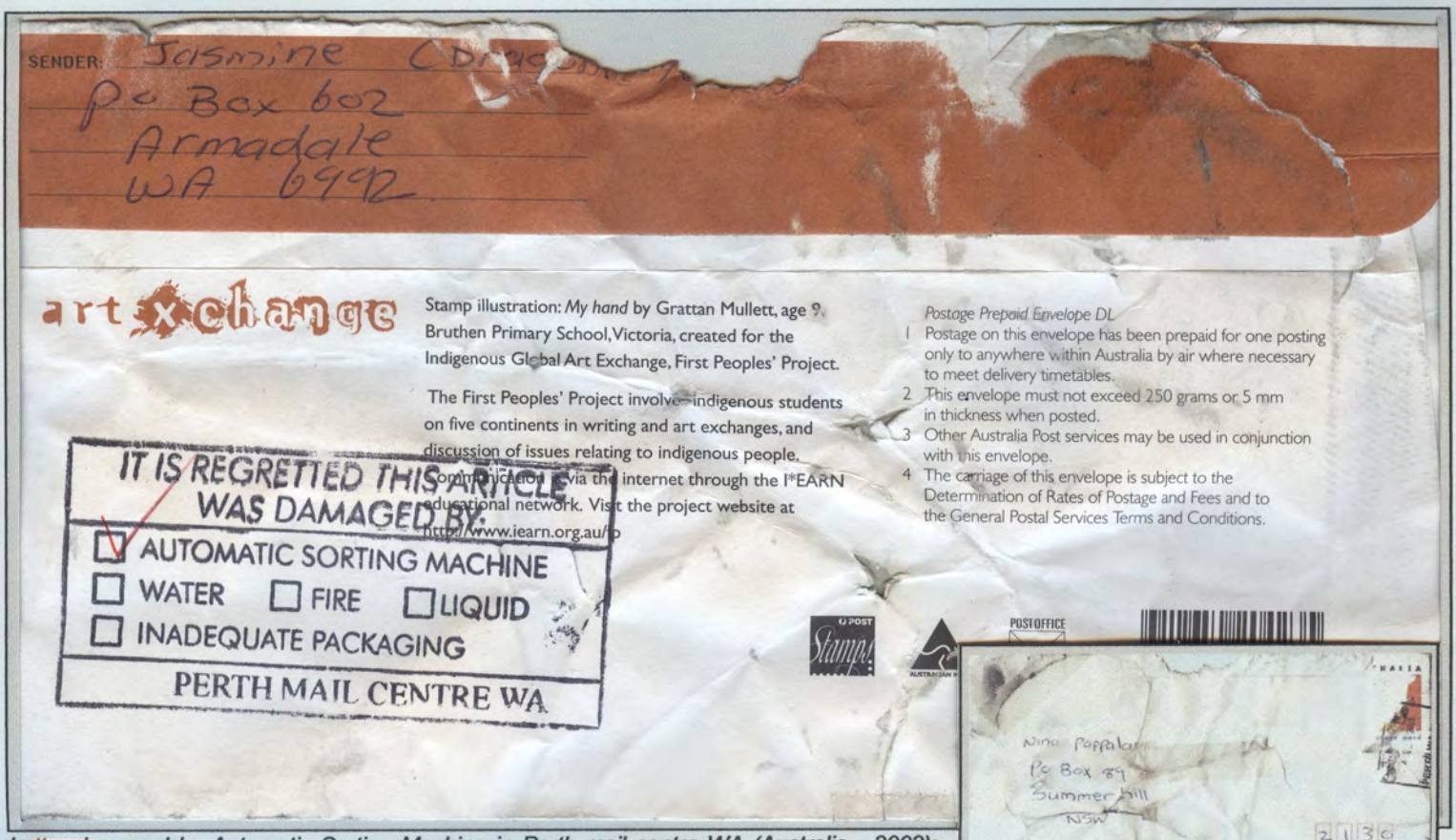
2.7 Coding with bars.

Once a letter has a corresponding bar code, the letter is transported to the sorting machine, where it can be sorted very quickly by that bar code.



Nowadays 39.000 letters per hour at peak can be sorted and canceled. To drop a letter into the right bin it need OCR software and mechanical transporting process supervised with lots of electronics.

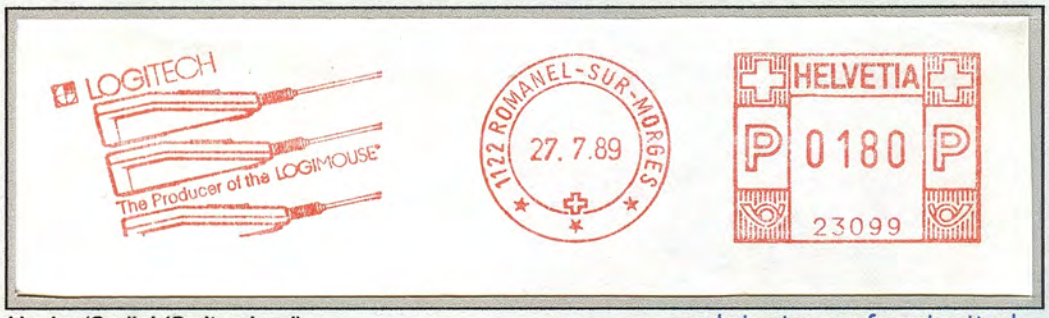
But a letter can get stuck, and jams and stops the whole chain.



Letter damaged by Automatic Sorting Machine in Perth mail centre WA (Australia - 2002); returned with apologies.

2.8 Point, touch or read your input.

use the mouse, pen or finger



Hasler 'Smile' (Switserland)

early Logimouse from Logitech

Overprint (Rumania) 300L on 90L dark green PC mouse symbol.

The best-known input device after the traditional keyboard is the "pointing device" - "mouse" in computer slang. It creates input by clicking selections on the screen. The motion of the pointer on a display can be any symbol like an arrow or a hand.

Early used 'Sloper arrow' cancel, Liverpool 1871.02.04 (Great Britain); used to speedup cancelation to cover massive sending of very popular card.

hidden rolling ball

Light pen

The first pointing devices had a hidden rolling ball on the bottom side of the mouse, later technology detects the two-dimensional motion by infra-red light.

A *light pen* is a light-sensitive stick used in conjunction with a screen and allows to point to displayed objects or to draw with greater positional accuracy. Same with a *touchscreen* containing invisible internal circuits that reacts when touching with a finger or pointing stick. This way the position is known and the chosen item or selection can be processed.

Today each computer is equipped with a screen. Request and answer can instantaneously be seen. This is called data communication. Such equipment is called a **'terminal'**. In the very beginning everything was printed out on a printer or punch tape or punch card.

After the successful use of the terminal in the Apollo space project in the sixties, by showing results via the cathode tube about measurements of the Saturn-V rocket, it became a common tool for real-time processing.

Radiogram via RCA (USA)

The RCA110A computer was an important phase in telemetry and real-time data display.

RCA (Radio Corporation of America) and GE (General Electric) built two computers, GE225 and GE235, to combine their telemetry knowledge and to display all measured data at NASA. Later other control centers did the same.

Perfin G(E) Precancel Lynn Mass (US) with control hole in center around the G

General Electric Research Labs are in Lynn, Mass

Soviet flight management center ▶

◄ *Specimen*
IBM 3270 terminal

Communicating via
Asynchrony
Transfer Mode ►

A terminal (dumb workstation for only data communication), made of cathode-ray tube, is connected to a mainframe, and has no processor inside what limit their capabilities compared to a PC. But PC's can communicate with mainframes using an emulator build on the Asynchrony Transfer Mode Protocol, which makes a PC so multi-functional.

virtual reality headset

Pitney Bowes-GB "6300" (Sweden)

early Wang terminal only text capabilities

Recent evolution of plasma (flat) screens, light weight and only a few centimeters thick, save an enormous amount of space on every desk and consumes remarkably less power due to employing liquid crystals and electro luminescence.

Modern virtual reality headset displays are based on those flat screen and smartphone technologies, creating a feeling of immersion and displaying virtual worlds.

high graphical resolution flat screen

Missing color magenta ►

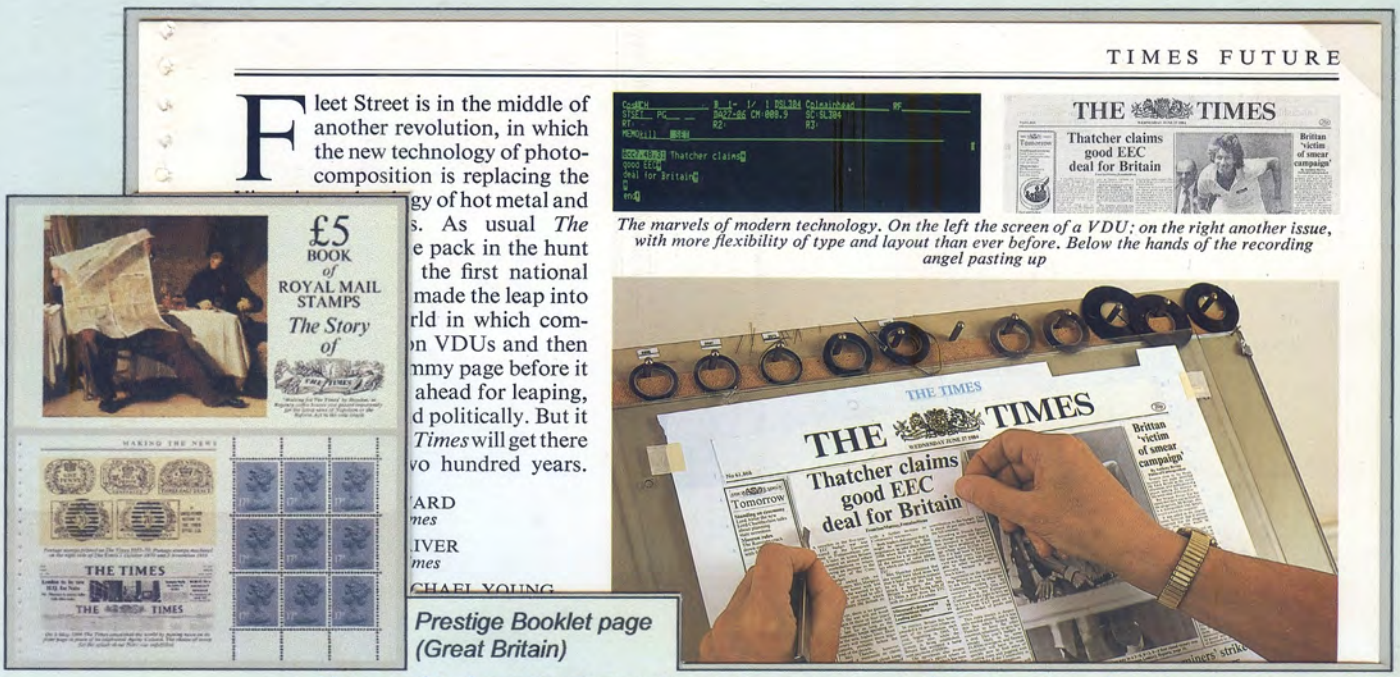
◄ Misperforation (Nord Korea):

Research and education screen usage

Displaying data is important, data has to be checked. Results and logs for verification increase the quality and quantity of decisions.

WYSIWYG "What You See Is What You Get"►

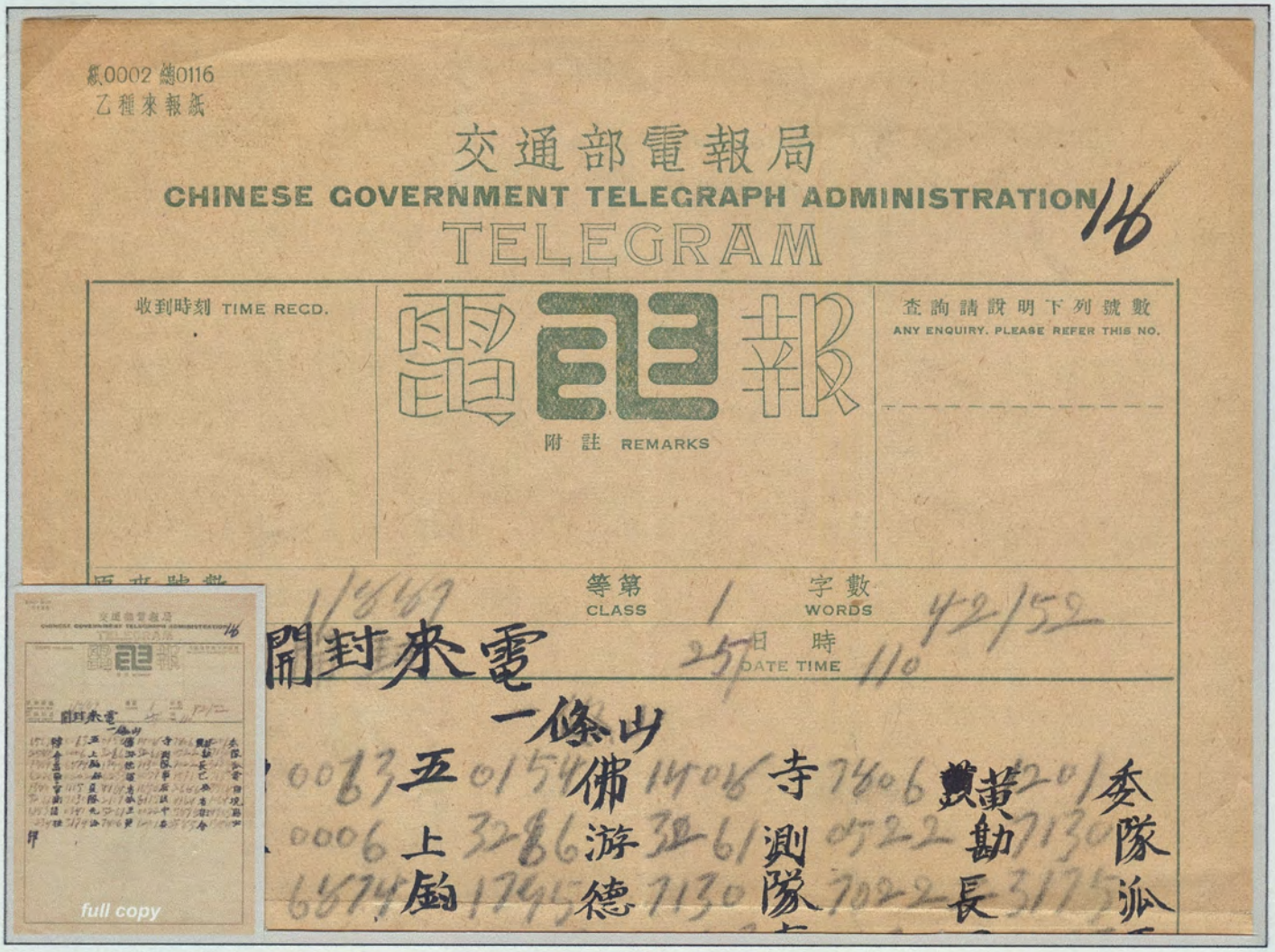
Graphical interfaces show documents, as they would be printed later on a printer. This is a big advantage compared to the old fashion non-graphical terminals. Most applications deliver **WYSIWYG** output.



The marvels of modern technology. On the left the screen of a VDU; on the right another issue, with more flexibility of type and layout than ever before. Below the hands of the recording angel pasting up

Prestige Booklet page (Great Britain)

Non-graphical printing instructions on a green terminal screen. Example printed output at right.



Telegram (China) with local characters manually translated in DBCS code by clerk before transmitted to recipient, where again manually translated to readable Chinese characters.

Double-byte character set (DBCS) enables application software to display and process ideographic languages including Japanese, Korean, Simplified Chinese and Traditional Chinese. Conventional single-byte code pages of 255 characters are inadequate to store the thousands of characters that these languages require.

Stationery (South Korea)
PC screen with Asian double-byte characters

Pane Prestige Booklet (Great-Britain) BBC expertise in multimedia.

Multimedia is without doubt one of the most important technology evolutions since the 90s. The audiovisual interactive capacities are moving images, spoken comments and music.

Basic equipment is a powerful PC or handheld with a lot of RAM, graphical interface, CD or DVD-player, loudspeaker system, keyboard and mouse or/and joystick.

3

The invisible intelligence, the software.

3.1 From mechanical thinking to...

Automating by algorithm

Algorithm is derived from an Arabian mathematician's name Abu Ja'far Mohammed Ben Musa al-Khowarazmi, spelled closely to the term ***algorism***. Around 820 AD he wrote treatises as ***al-jabrawa al-maqàbala*** on Hindu arithmetic and algebra, which is taken as the source for the term ***algebra.*** Algebra and algorism is key in automating processes.

Leibniz

Watermark (China-1897) small dragon: yin and yang symbol

CityPost local postal (Germany)

Leibniz binary code

The mathematician and philosopher ***Leibniz*** demonstrated in a paper the binary system. He proved that all figures and characters could be represented as 0 and 1. It was based on his findings found in a Chinese document about yin and yang dualistic philosophy.

Musical Box

Jacquard's loom

Artist proof in blue designed by A.Ouvré based on painting of C. Bonnefond ►

The Jacquard's weaving loom technology was the first system (punch cards) corresponding to the programs of today. The holes in the punch card or punched wheels (musical boxes) were the ones, no hole was a zero. The series of holes became the program steering the device and the punch cards or punch wheels were replaceable by other ones.

Punch holes, gears or toothed-wheels were the first machine programming tools.

meterstamp (Germany - 1941) KomusinaT&N type A; red meters were considered as advertisement; black meterstamps with a stamp looked more personalized. This experiment didn't last long (period 1935-1944)

Gears in logo Company Otto F. Champion ►

▲ *yellow shifted – ill. Jean de Nivelles,*
Golden Jacqemart automate from Nivelles (Belgium)

Stationery (Germany) printed to order ►
Electric art nouveau automated restaurant in Berlin

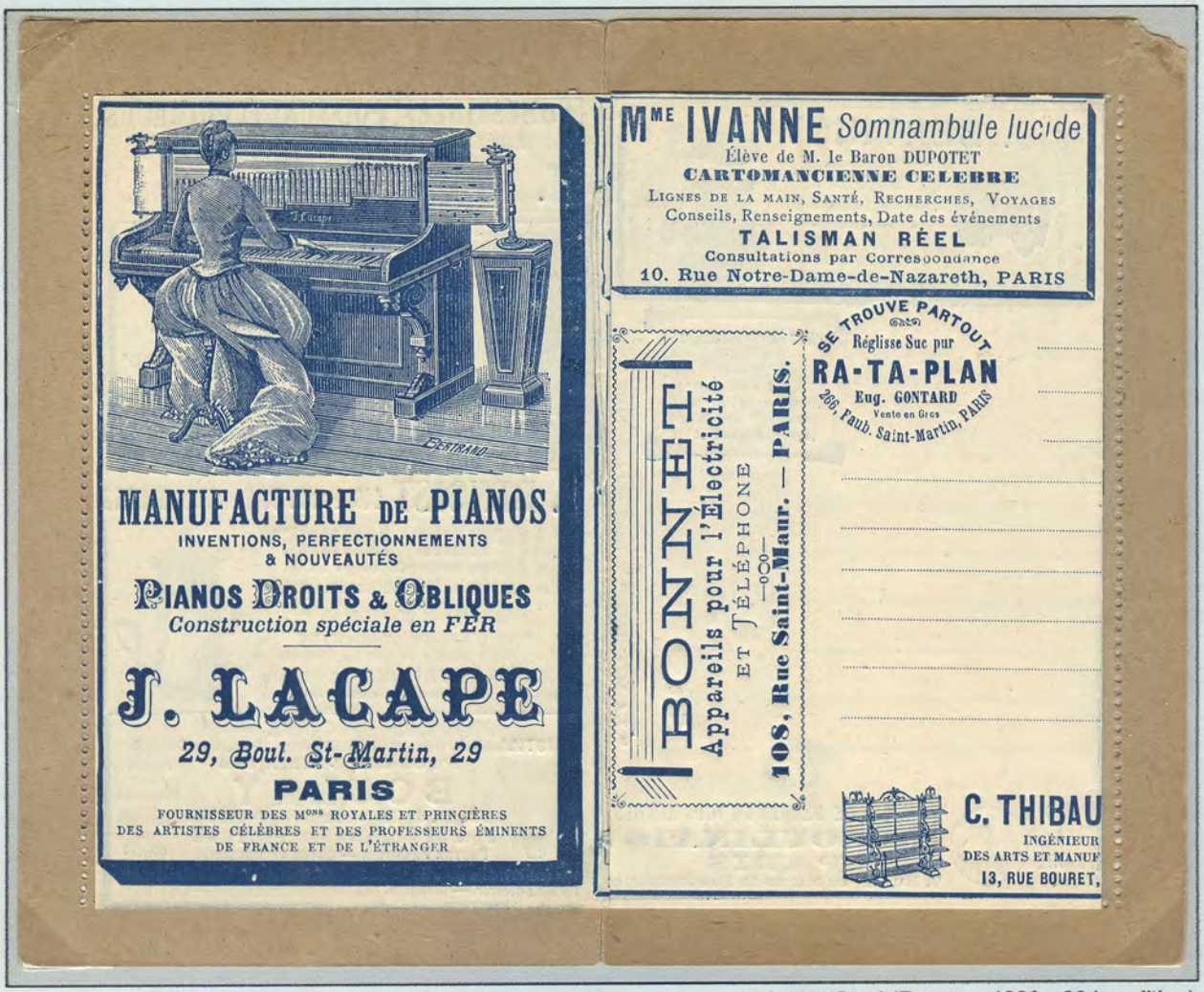
The start of automation by scanning and programming to control automated repeatable movements. Precise work is a must to success and...

5 ring gears cancel 87-Mannheim (Baden - 1860) ▼

▲*variety: EURQPA (Q i/o O)*

▲*black shifted*

... no errors are allowed.



▲ *Letter Card (France - 1889 - 291e edition)*
Piano music is recorded (punched) on a strip of paper.

Inventions such as a musical box, barrel organ or automated and animated mechanized metal figures are the first machine programming events. Punched medium is the most used media in the beginning.

Fürther Kirchweihleben.

Af d'Färtha Kärwa, na,
Dou freut si grouß und kla;
Es ko nix schön'res geb'n
Als so a Kärwaleb'n.
Ja scho am Sonntog fei
Dou fahr'n nach Färth glei rei
Ganz haftenweis die Leut,
Weil dös is halt ka Freud!
Am Plärrer af der Boh
Kommt grad as Dampfroß oh,
Dou sterz'n si die Leut
Af d'Wög'n hie, wie net g'scheid.
Die allergrößte Naß
B'setzt glei die erschte Klaß,
Der Kondukteur schreit:
„Nrraus!"
Den lacheus ner blouß aus.
Und kommas dann nach Färth,
Geht's hi zon Miß'n-Werth,
Zon Kütt, Nett, National,
Und afn freia Ball.
Und wer im Wertshaus hout
A Broutwurscht und a Kraut
Der dörf zufried'n sa
Und sen's a no so kla.
Gar mancher, der recht karg,
Der ärgert sich auch arg;
Denn d'Krölgwern gfüllt da af,
Daß fehlt a Schoppen draf.
Der Harfenisten Zahl
Bringt „Leben" ins Lokal;
Sie geb'n si alle Möih,
Is d'Stimm a oft net schöi.
Sie spielu den „Hampelmoh",
„Die kleine Frau", so, so!
D'Leut stimma glei mit ei
Recht kräfti zum Refrai.
Wenn's Singa geht so schöi,
Macht's Trinken a ka Möih
Und Ansichtskarten fei
Wern g'schriebu a Dutzed glei.
Der Kellner schimpft und brummt,
Weil jetzt der „Bayer" kummt,
Singt der sei Leib-Couplet
Im Gang bleibt alles steh.
Und schreit der Kelluer: Soos!'
Dann geht's Gewärg erschtlos.
Mer schöibt si hin und her,
As Umfall'n des göiht schwer.
Jetz göihts vor af die Meß,
Dou machens erscht ihr Späß.
Mer schaut die Bud'n oh,
Kaft Plätzli und Bonbo!
A jed's freut si scho draf,
Af'n Kinematograf.
Mer gafft beim „Kasperl" dort
Und laft beim „Sammelu" fort.
Vom Fotografenmoh
Läßt mer si schmui'n oh,
As Schöiß'n wird probiert,
Die Damen dort poussiert.
Nou steig'ns af's Karouffel,
Sie sen scho nimmer hell;
Und steig'ns vo dort dann ro,
Nou draht si's aber scho.
Am Rathaus langt mer glei
Töif in Glückshof'n nei
Und zöigt mer a nix raus
Da macht mer si nix d'raus.
Beim Hermann hint'n singt
Die Gusti, daß es klingt
Und sammelt fleißi ei,
Ja dös verstöihts gar fei.
Zum Kneipwert abends dann
Geht schwerbeladen man;
Mer thout politisier'n
Und fest a kritisier'n,
Daß m'r d'Kärwa will verleg'n!
Dös ko ka Mensch versteh'n.
Die Kärwa, dös is klar,
Mouß bleib'n wöis bisher war,
Nou schwelgt a jedes Herz
In Frohsinn und in Scherz.
Zlezt is mei Wunsch no der:
„Kummts fleißi alle her
Ihr Gäste, lölb und wert,
Af Kärwa rei nach Färth."

Verlag von A. Schmittner, Fürth.

◄ *Stationery privately printed (Bavaria) text and image about Ecclesiastical life:*
Barrel organ

◄ *Specimen*

Von Kempelen

Already very early men always tried to build automates that have its own capabilities of thinking and in function of working for mankind.

In 1769 a chess playing automaton known as 'The Turk', was invented by the Hungarian baron **Wolfgang von Kempelen**. It was in fact a trick. The automaton was big enough to hide somebody small inside who operated it.

Karel Capek

Torres Y Quevedo, known for his chess endgame automaton, introduced cybernetics. A mechanical contraption realized in 1912 as a clever accomplishment in classical mechanics.

In 1921, the Czech author **Karel Capek** produced his best-known work, the play *R.U.R. (Rossum's Universal Robots),* which featured machines (ROBOTs) created to simulate human beings.

The Czech word "robota" refers still today to work that's boring or uninteresting and someone is obliged to do and not voluntarily or for fun.

Torres Y Quevedo

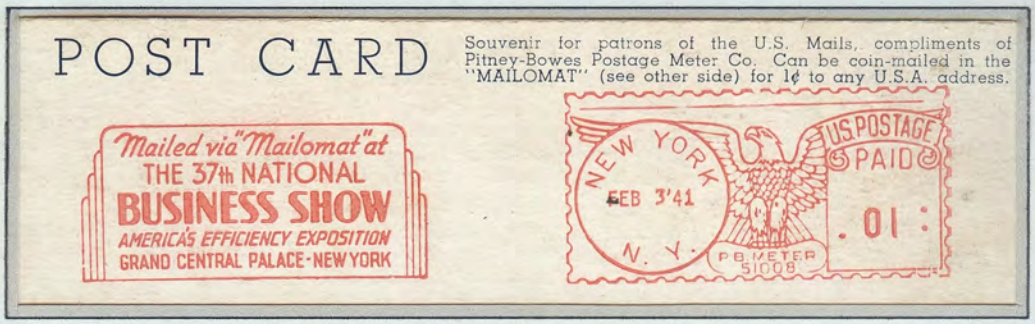
chess automaton

Specimen meterstamp model Neopost with prefix N (Great Britain) - text: Automatics

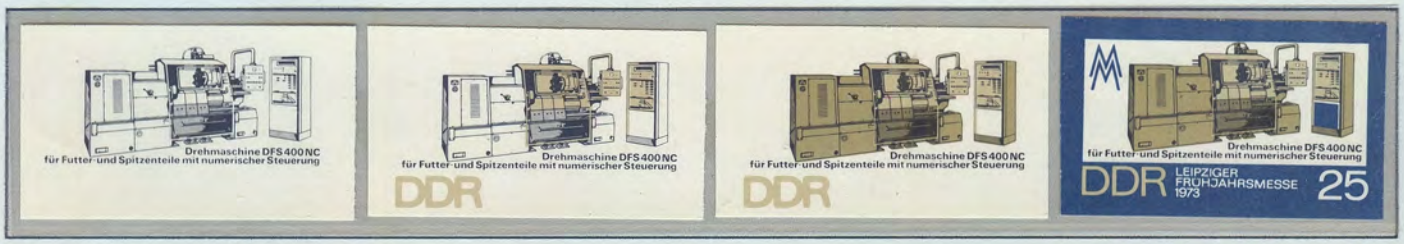
A jukebox is a nice example of a robot.

Publibel (Belgium)
Robot AMI Jukebox

Automates perform in a fast and continuously way, tasks that need a lot of concentration or are too repetitive for humans. and also time and energy consuming.



Pitney Bowes "Mailomat" (USA -1941 - B 51000 series); self-service automates; 72 letters/min



Progression proofs (East-Germany)

numeric steering lathe machine

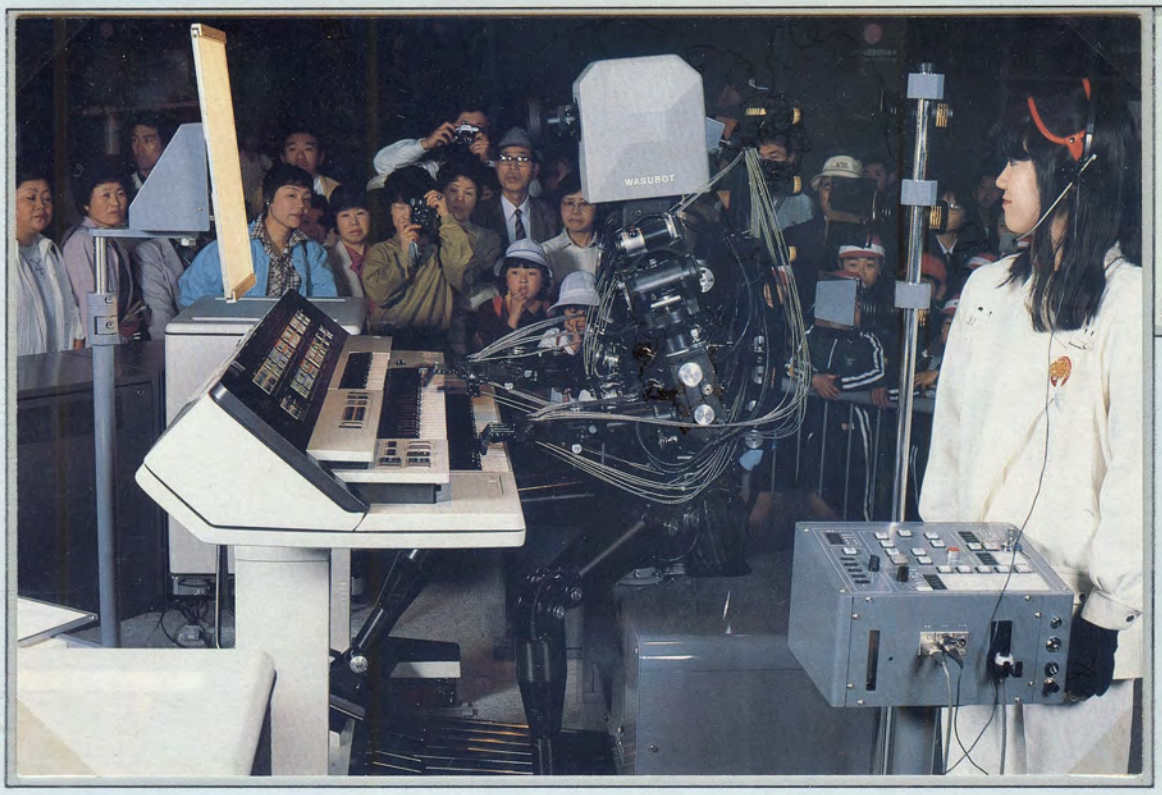
Automates or robots perform mathematical operations on continuous measurements, such as temperature, pressure, time, etc..., and are controlled by instruction sets on punch tape, punch cards, or ICs or connected to a computer.

Robots are mechanical or virtual artificial agents, usually electromechanical machines that are guided by computer programs stored on ICs or chips or electronic circuitry.

Programmable Chip

Real robots are not yet a fact! From the very beginning men have been trying to replicate parts of the human body and mind. But since the invention and miniaturization of the computer, many attempts have been taken place with partial successes.

The ICs or chips are developed and designed with computers and produced with fully integrated automates or robots with high efficiency and perfect results. Conclusion: robots are making robots.

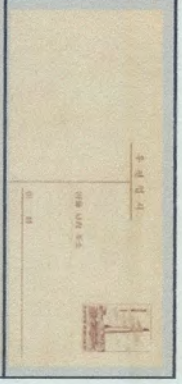


Regional stationery (Japan)

Wabot-2 active at Tokyo Expo 85

Japan and South-Korea are far ahead in developing robot technology. In 1980 laboratories of the Waseda University started the WABOT-2 project. This is an anthropomorphic intelligent robot WABOT (WAseda roBOT) playing a keyboard instrument and was set up as an intelligent task that the WABOT-2 aimed to accomplish. The robot was shown on the Tokyo Expo in 1985.

◀ *Stationery (Nord Korea)*



In the early 1970s the Russian space organization put an unmanned spacecraft on the moon and brought it back to the earth with success. This whole automated operation was directed from earth in combination with pre-programmed procedures.

Binary: 0 and 1
IIIO IOIII = 471

Electronic calculators or computers are programmed to work with 1 or 0; it is the only thing they know by default something is switched off or on. In the beginning programmers used machine language to program their computers and stored (wrote) them on punch cards.

Trial Color Proofs (Monaco)

the programming language PASCAL is an ode to Blaise Pascal.

Later specific high(er)-level programming languages simplified their task. Some programming languages were specially developed for specific environments to ease the task of the programmer for that specific application, like ASSEMBLER, COBOL, PASCAL, C and many others.

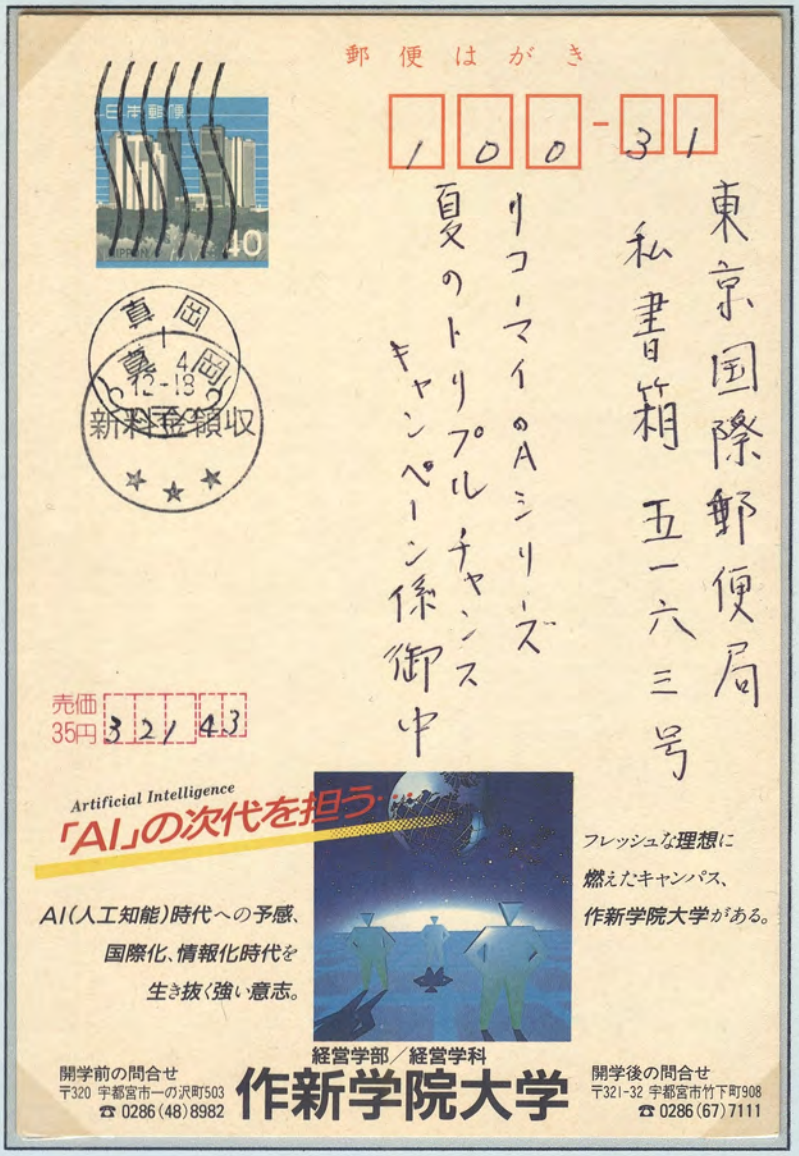
Letter sent from New York on 3.03.1866 to Cognac, France arrived on 3.04.1866 per ship called 'Java'

Misperforation

The labs of **Graham Bell** the programming language "C" was developed to control their telephone exchange systems.

Encased postage stamp (Denmark) WWII: to resolve coinage shortage

Even for the internet world a specific language called JAVA was developed. It was named after the famous coffee brand "Java", because it was consumed in large quantities by the language's creators. The coffee brand "Java" comes from the Island of Java, name first given by the Dutch.



A typical Artificial Intelligence (AI) is programmed to analyzes its environment and takes actions that maximize its chance of success. Many AI algorithms are capable of learning from data.

Artificial Intelligence

Most AI-systems today are in supporting mode but lack several features of human "commonsense reasoning".

◀ *Echocard (Japan) text: A.I. Artificial Intelligence*

There are plenty of examples in all kinds of areas. As an example, aviation uses A.I. already today in aircraft diagnosis, flight planning, weather analysis, all kinds of autonomous operations and detection, also in Air-Traffic and fleet optimization. The most visual application is the detection and analysis of the plane environment and actions taken by the plane computers. In the past human errors caused many cases airplane crashes.

Crash Letter (Spain to Argentina): A plane Lockheed L-1049G Super Constellation, of the Iberia Company that flew the MADRID-SANTIAGO DE CHILE route. During descent on March 6, 1961 on airstrip at the Sao Paulo airport (Brazil), pilot carried out an instrument approach and misjudged distance and failed to compensate for wind conditions. Letter was recovered and distributed inside an envelope with cancel Correspondêcia Danifica-/da, salva do Avião/sinistrado em /6-3-61, em S.Paulo-Brasil /PROC. 20232/61.

3.3 Electronic intelligence using machine languages

As human beings are involved in engineering software or using tools and data, they quickly learned to work together and share their knowledge. The development of the profession and image of software engineering gained popularity through scholarships, research and international forums.

Free Post (Great-Britain) as Member of Parliament from Earl of Horrowby: was president of the organization 'Royal Statistic Society' from 1842 till 1843.

The **Royal Statistics Society** had members as **Charles Babbage** and Belgian statistician **Adolphe Quetelet**.

Already very soon organizations and groups were started up to closely aligned in philosophy, strategic directions (promotion), applied for the public good. and values.

Cancel 06.06.1900 Torino COMPUTISTERIA (Italy): Early naming accounting department.

Since 19th century bookkeeping and statistics became a common profession using calculators and archiving tools.

Photo Proof (Tonga)
support network specialists

operator

programmer

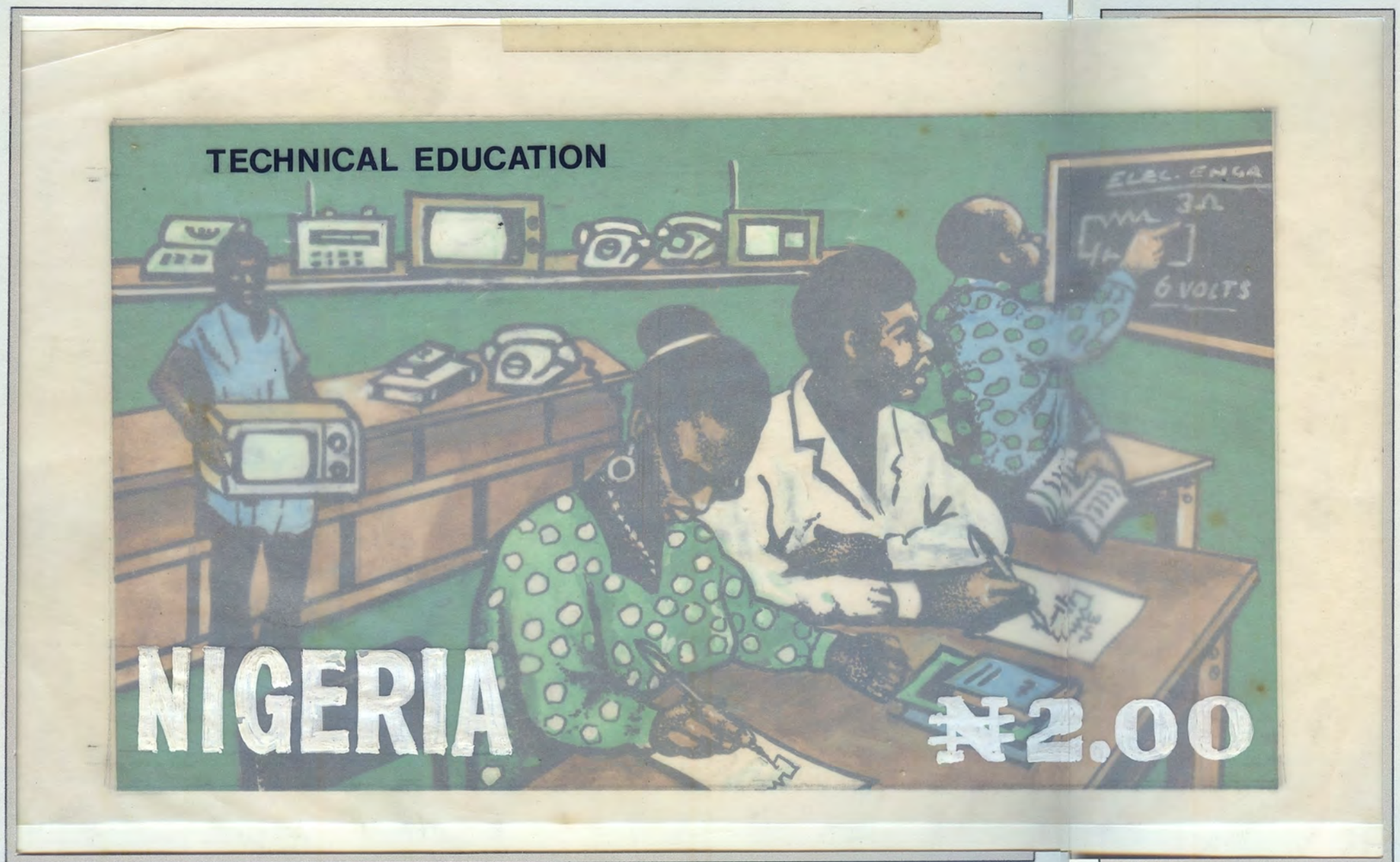
systems engineering symposium

Today IT people such as system engineers, network specialists, programmers, operators, analysts and helpdesk support are in every company.

Perforation error (USA)

Computer repair technician starts by learning elementary electronics and ending in work of variety of settings; such as building, configuring or replacing new hardware, installing and updating software packages, and creating and maintaining computer network.

Technologies are changing rapidly in a constantly changing world. Computer specialists have to accept a long life of **"learning never ends"**.



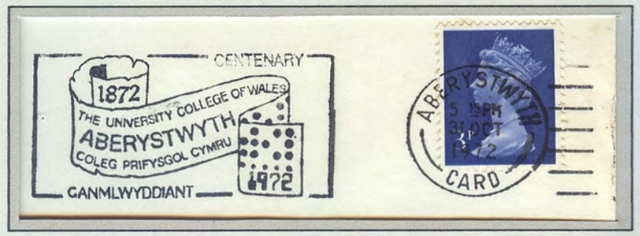
Original hand-painted artwork on board for N2 value from Life Definitives serie (Nigeria) by Godrick N Osuji

learning elementary electronics

3.3 Electronic intelligence using machine languages computer education

Preprinted MIT return address on stationery (US); Postal administration provided free of cost printing services

The **Massachusetts Institute of Technology** (MIT) is famous for its research and education in information technology engineering. MIT researchers made fundamental contributions to cybernetics, artificial intelligence, many computer languages, network technologies, machine learning, robotics, and cryptography.



Computer Science at University of **Aberystwyth**, founded in 1970, conducts research in automated reasoning, computational biology, vision graphics and visualization, and intelligent robotics

Children today gain computer skills at very young age by playing on the computer at home or by using it in school in a very basic and easy way.

Computer education is learning or teaching about computers, including practical techniques for developing and implementation of computer systems and applications.

Francotype CC (Netherlands)

early amusement automate

What started with electromechanical amusement automates, are today almost-human intelligent computer games equipped with artificial intelligence (AI) technology using more and more processor power, and which can defeat most of the human players.

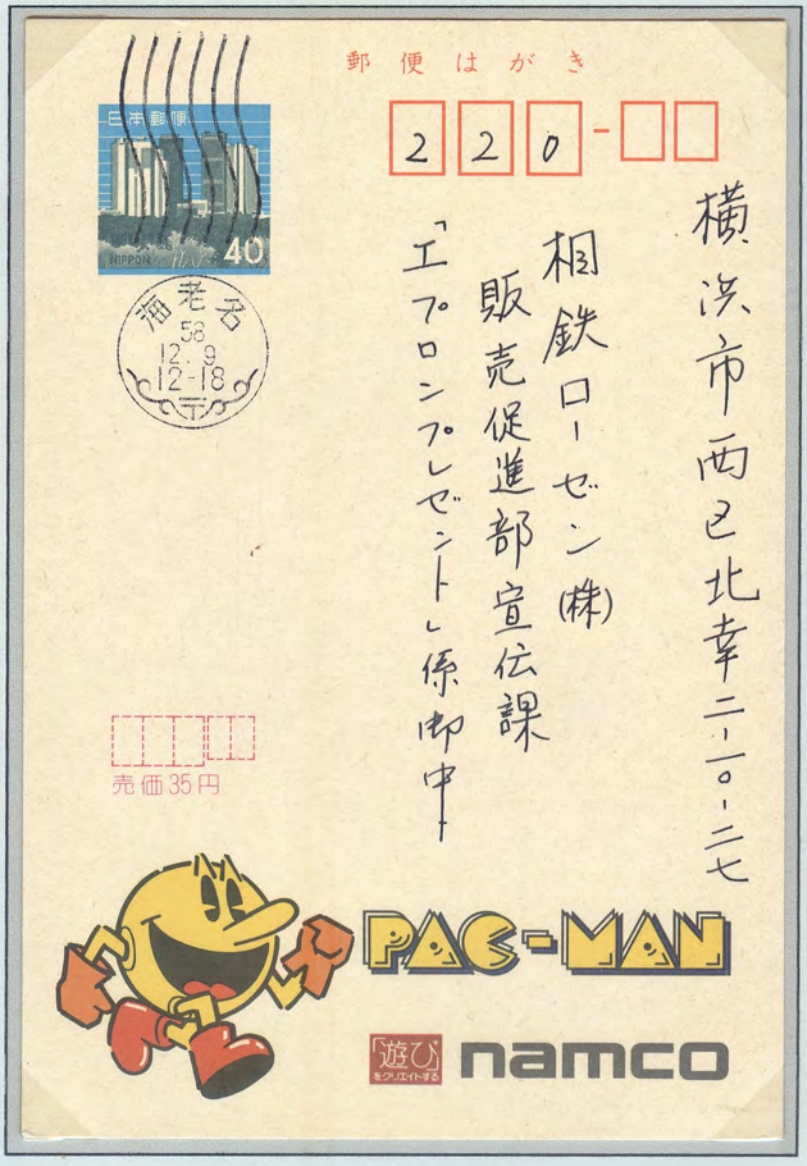
postal point 'PP' vignette (Belgium)

computer store

Computer games and all kind of software can be bought in computer stores.

The first popular games were Pac-Man, Space Invaders, chess ... later more sophisticated games as Mario, Sonic The Hedgehog, ...

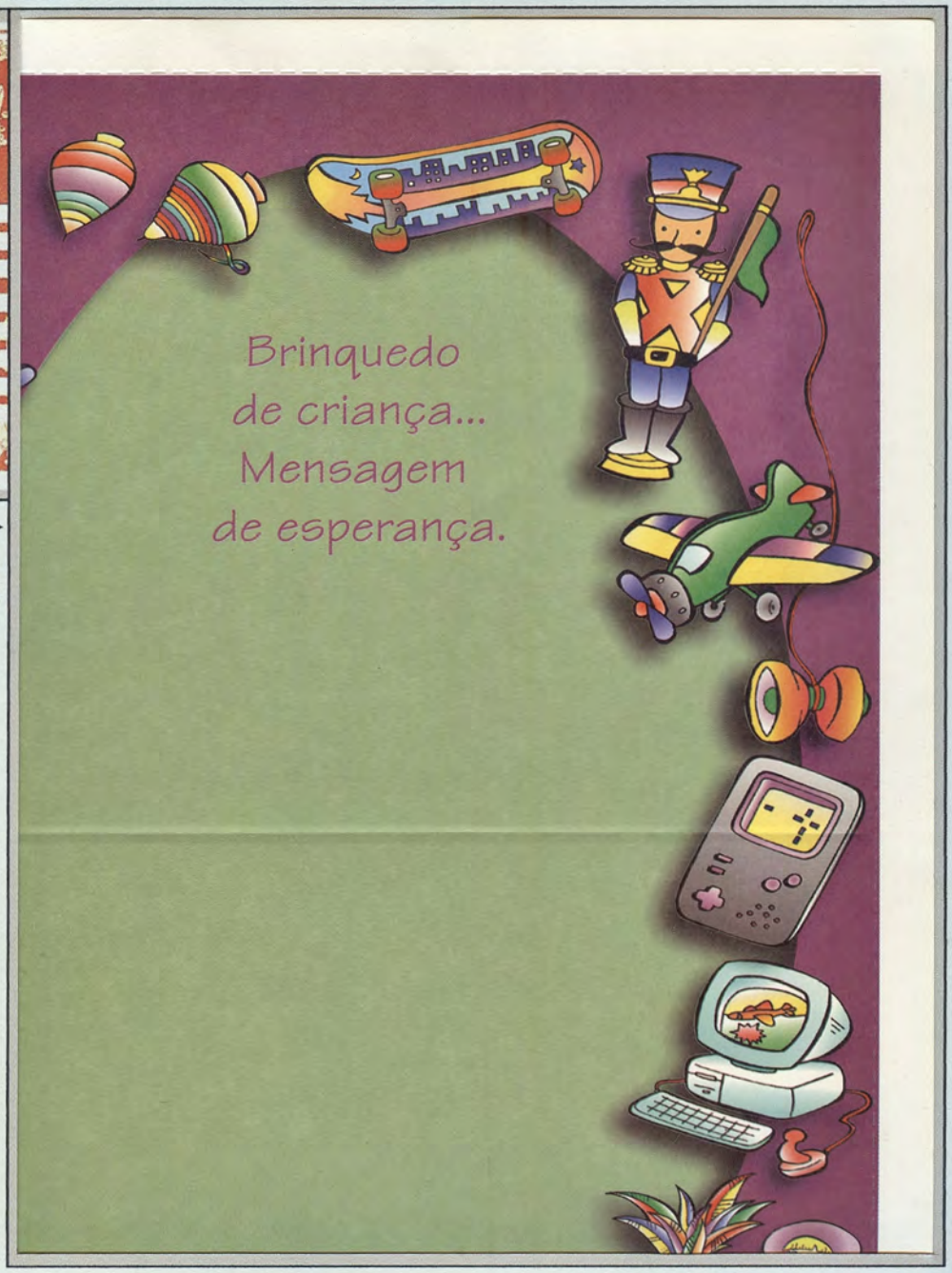
Most games had many levels that players could increasingly select.



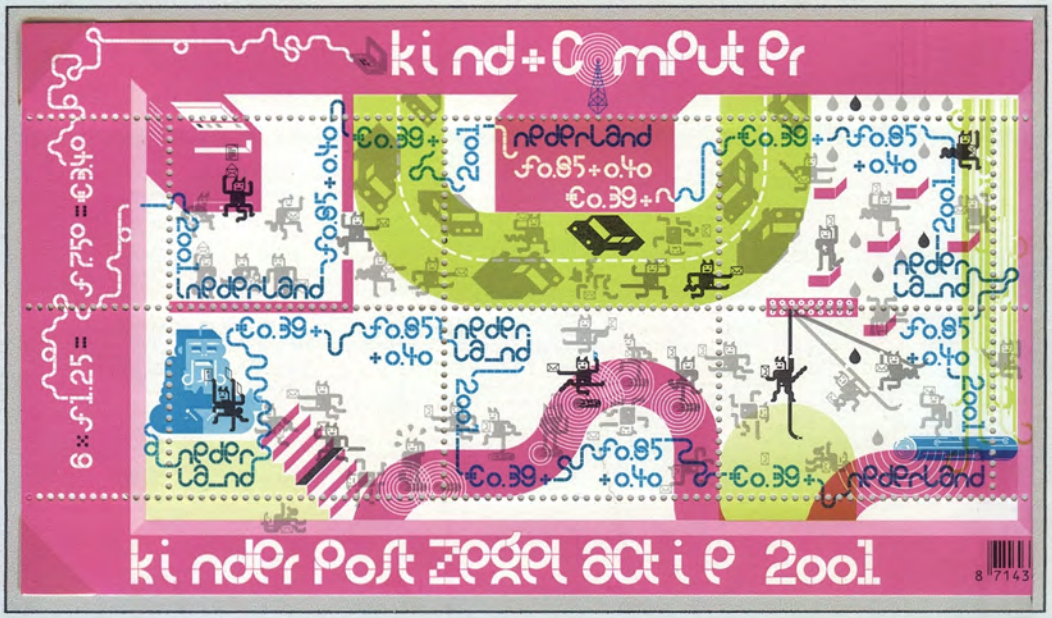
Telegram (Brazil) ▶

Game boy and
PC with joy stick

Play station



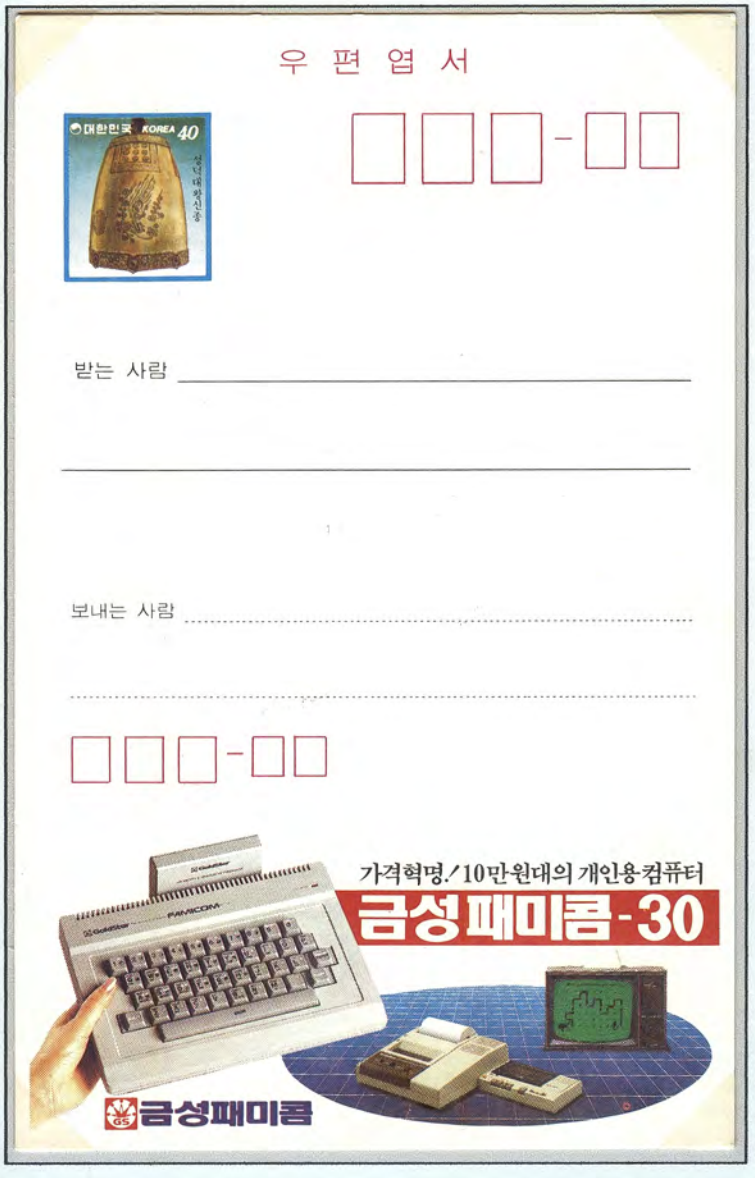
Special play consoles and PCs are available with high resolution graphics, stereo-sound and high performing interactive games with the ability to play different games on a single system.



Addiction

Games are so immersive that it's easy to play for hours and hours without even noticing that a minute has gone by, and you begin to live in a world where you expect instant gratification.. it's called addiction to gaming.

Today's toys for children are computer games in low or high resolution with a wide range of experience and skills.



Thanks to the increasing popularity of the Internet, became online distribution of game content more common as well gaming with others over the internet in the same game.

Héros des jeux video

Several Virtual Reality gloves and head mounted displays were released for gaming during the mid-1990s and give the player an experience difficult to explain. You have to feel it, do it and live it!

The need to implement automated processes is because companies have a lot of different obligations and tasks. Therefore applications are built on computers by which manual actions can be limited to the minimum. But it started all manually…

One-penny MULREADY envelope; used in 1840 from London to Margate, cancelled with red Maltese cross.

Ill. left; clerks writing down commercial transactions

In the beginning clerks made notes of their sales transactions in special books that need to be kept in a safe place for years.

Stationery (Russia - 1934)

a classic card-index box with separators

Later the card-index cabinet was introduced. Written or typed cards were classified in different ascending or descending ways, so that finding certain information was much easier.

With growing amount of data on cards and punch cards the need for microfilm was rising. Also microphotography was first suggested as a document preservation method in 1851.


409 424

Pigeongramme on film: pigeon flight organized by 'telegraphes et postes' 10-20 jan 1871
2e serie pages 409-424

But it first saw military use during the Franco-Prussian War of 1870–71. During the Siege of Paris, the only way for the provincial government in Tours to communicate with Paris was by pigeon post. As the pigeons could not carry letters, the Tours government turned to microfilm.

Using a microphotography unit clerks in Tours photographed paper dis-patches and compressed them to microfilm, which were carried by homing pigeons into Paris and projected by magic lantern while clerks copied the dispatches onto paper.

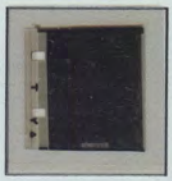

Write address in large BLOCK letters wholly within this panel
The address must NOT be typewritten.
TO:- MISS. G. WEBB, P.O. BOX 867. MIDLAND. ONT. CANADA.
976462
Write the message very plainly below this line.
The proprietors and Editor of "The Aero Field" send their greetings for Christmas and the New Year by the 72 years old method that has been revived in the present emergency.
These illustrations of the 1870 service transmitted by the new method are an interesting souvenir of both events.
Sender's Address Sutton Coldfield, England.
Date 16th. November 1942.
OPEN LETTERS for PARIS.
Transmission of by Carrier Pigeons.
Inflating the balloons by which pigeons for flying the micro-photographic messages into the city were carried from Paris.
On arrival in Paris the pigeon post "Air-graphs" were enlarged by a lantern for transcription.
By Command of the Postmaster-General.
(British P. O. Notice of 1870.)
This space should not be used.
MAKE SURE THAT THE ADDRESS IS WRITTEN IN LARGE BLOCK LETTERS IN THE PANEL ABOVE

▲ *Airgraph (Great Britain) (12 XI 1942) with censor mark (Sutton Coldfield - Birmingham) to home.* Unclear dark image bottom same as image in Prestige booklet below. Text: transmission of by carrier pigeons celebrated 72 years later using same technology.

In 1870 during the Franco-Prussian War, the Siege of Paris cut communications for The Times. Above: *dispatches and personal advertisements for the Agony Column were flown out by balloon.* Below: *microscopically reduced messages were carried in and out by pigeon, and magnified by electric light*

Prestige stamp booklet "The story of The Times" (Great Britain)
microscopically reduced messages were carried in and out by pigeons, and magnified by electric light.

The US Victory Mail and the British "Airgraph" system were based on microfilm technology, and were used for delivering mail between those at home and troops serving overseas during World War II. The systems worked by photographing large amounts of censored mail reduced to thumb-nail size onto reels of microfilm, which weighted much less than the originals would have.



▲ *Original piece of microfilm of a V-mail.*

V-Mail Service provides the most expeditious dispatch and reduces the weight of mail to and from personnel of our Armed Forces outside the continental United States. When addressed to points where micro-film equipment is operated, a miniature photographic negative of the message will be made and sent by the most expeditious transportation available for reproduction and delivery. The original message will be destroyed after the reproduction has been delivered. Messages addressed to or from points where micro-film equipment is not operated will be transmitted in their original form by the most expeditious means available.

INSTRUCTIONS

(1) Write the entire message plainly on the other side within marginal lines.
(2) PRINT the name and address in the two p
of the Armed Forces should include r
which attached, and APO or Naval ad
(3) Fold, seal, and deposit in any post-office letter drop or street letter box.
(4) Enclosures must not be placed in this envelope and a separate V-Mail letter must be sent if you desire to write more than one sheet.
(5) V-Mail letters may be sent free of postage by members of the Armed Forces. When sent by others, postage must be prepaid at domestic rates (3c ordinary mail, 6c if air mail is desired).

☆ GPO 16—28143-3

MAIL

See Instruction No. 5

▲ *Original unused V-mail (USA): text: explanation how the message will be processed and send to the addressee.*

Write the address in large
The address must NOT be typewritten.

28443

MR. TO:— C.U. DOWNES,
AHIARUHE,
CARTERTON,
NEW ZEALAND

Write the message very plainly below this line.

"THE AERO FIELD" SUTTON COLDFIELD, ENGLAND

To Commemorate
The Last Airgraph Despatch, July, 1945

A Page from the "H. Crabtree" Collection

The film reels were shipped by priority air freight to and from the home fronts, sent to their prescribed destinations for enlarging at receiving stations near the recipients, and printed out on lightweight photo paper.

▲ *Last day Airgraph (Great Britain) (31 JUL 45) with censor mark (Sutton Coldfield - Birmingham) to New Zealand. Ill. Showing Airgraph procedure.*

Write the address in large BLOCK letters in the panel below.
The address must NOT be typewritten.

TO:—

DATE STAMP

Write the message very plainly below this line.

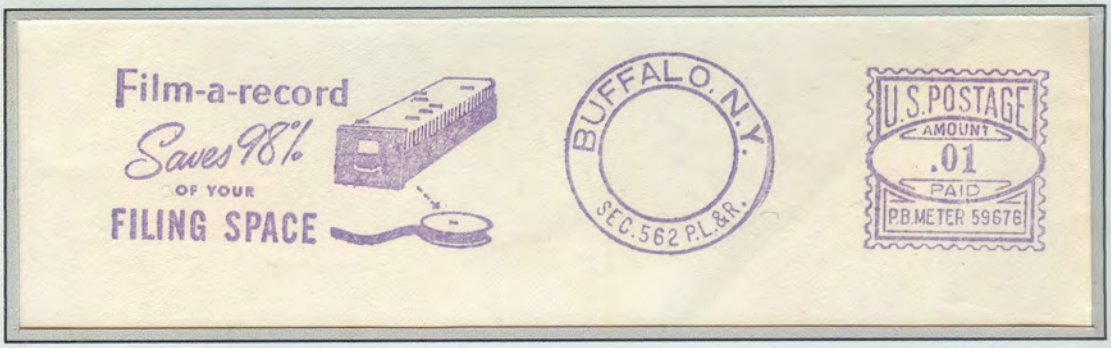
Sender's Name & Address "THE AERO FIELD" SUTTON COLDFIELD, ENGLAND

To Commemorate
The Last Airgraph Despatch, July, 1945

Prussian aggression has been directly responsible for the introduction, by its victims, of many novel methods of conveying messages, such as the Balloon and Pigeon Posts of Paris in 1870-71. With the Airgraph service, special forms are provided measuring 11" by 8". The letter sheet is then photographed on a film negative measuring ½" by ⅝" On arrival at the destination the negatives are passed through a continuous enlarger which produces a photograph measuring 5" by 4". These are dried on a wheel at the rate of 40 letters a minute, after which the copies are folded and placed in a special window envelope which bears the word "Airgraph" like illustrations above.

A Page from the "H. Crabtree" Collection

▲ *Last Airgraph despatch original unused sheet (Great Britain) (JUL 45): ill. and text: started in 1941and ended July 1945. Explaining the whole procedure; photographing the sheet, enlarged printing, drying 40 letters/min. folding into 'Airgraph' envelope*



Pitney Bowes model CV (US) type printed matte: saves 98% of filling space

Microfilm is compact, with far smaller storage costs than paper documents. Normally 98 document size pages fit on one fiche, reducing to about 0.25% original material. When compared to filing paper, microforms can reduce space storage requirements by up to 98%. Desktop readers are boxes with a translucent screen at the front on to which is projected an image from a microform or film.

Pitney Bowes model R (US) Microfilm reels and cassette

Microfilm as office automation technology played a strong supporting role in the paperless and automated office. Today more and more replaced by image databases, scanned by OCR readers.

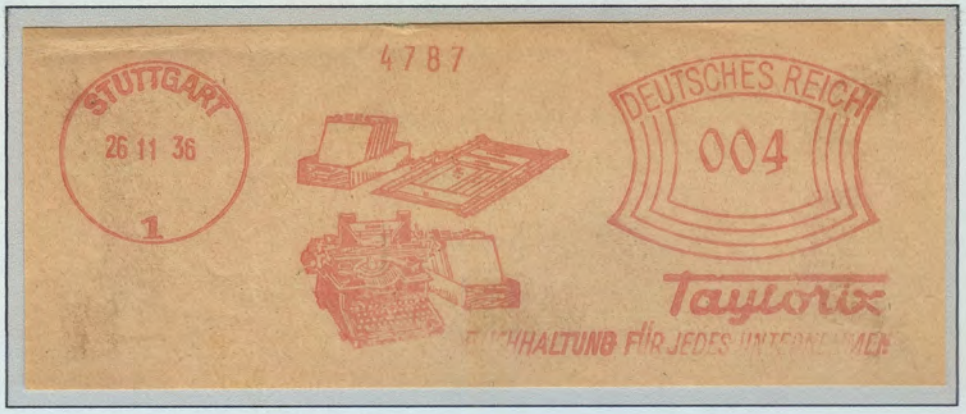
Missing perforation

Index *refers to post office (open 1902-1915) at Index Knitting Mills a hamlet in town Middlefield, in state NY.*
Word index refers to directing and pointing to, useful when searching in databases or a book.

Microfilm was in the mid-1900s a preservation strategy for libraries for deteriorating newspaper collections. Books and newspapers that were deemed in danger of decay could be preserved that way and even increase usability without destroying them more and more.

Relational database systems: ORACLE with SQL (Structured Query Language)

Providing quick response times and solid applications (especially database systems) to do business with customers is a main goal. For this reason index systems help queries on databases to reply quickly.



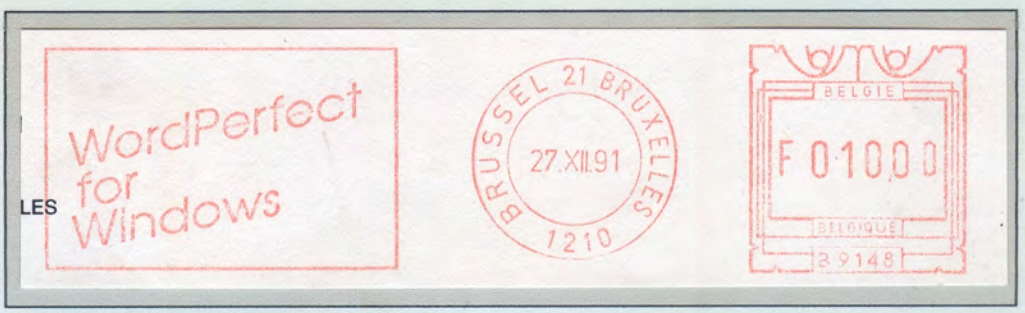
Calculators, bookkeeping machines, file cabinets, card-index boxes, planning, typewriters, etc., are tasks that can all be done a lot more and much quicker today by specific application software on an ordinary PC.

Misperforation; Queen Head and value centred (Great-Britain)

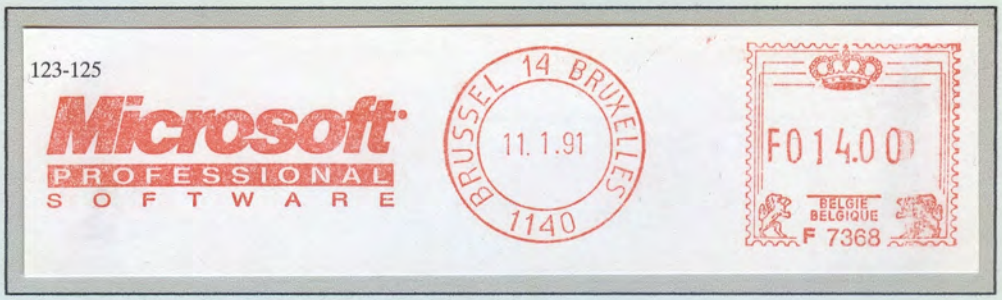
Steno shorthand and typewriter keys

Steno shorthand for quick notes

Since late 1800s typing and shorthand (an abbreviated symbolic writing method) increased speed and brevity of writing. Later dictation machines, special secretarial training and powerful word processors replaced those processes and speeded it up with even higher quality.



Hasler model mailmaster (Belgium)



Francotyp-Postalia "MS5/WK4" (Belgium)

Bill Gates and his friend Paul Allen founded Microsoft in 1975. Their first product was the program language BASIC. In 1980 IBM chose Microsoft to supply the operating system DOS for the IBM PC.

IBM operating system OS/2

SECAP "N" (France) text: 2 seconds response time for air flight reservation

When the powerful graphical user interface (GUI) of the Apple computers became popular, IBM and Microsoft developed together the very stable operating system OS/2.

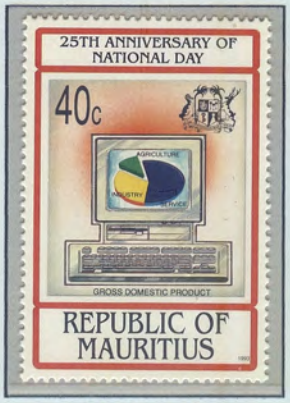
However, later on, Microsoft broke with IBM and developed their…

Windows platform

blue color proof ▲

… own Windows platform and many graphical products with easy to use interface.

Die proof 2nd phase End (Austria) Statistics



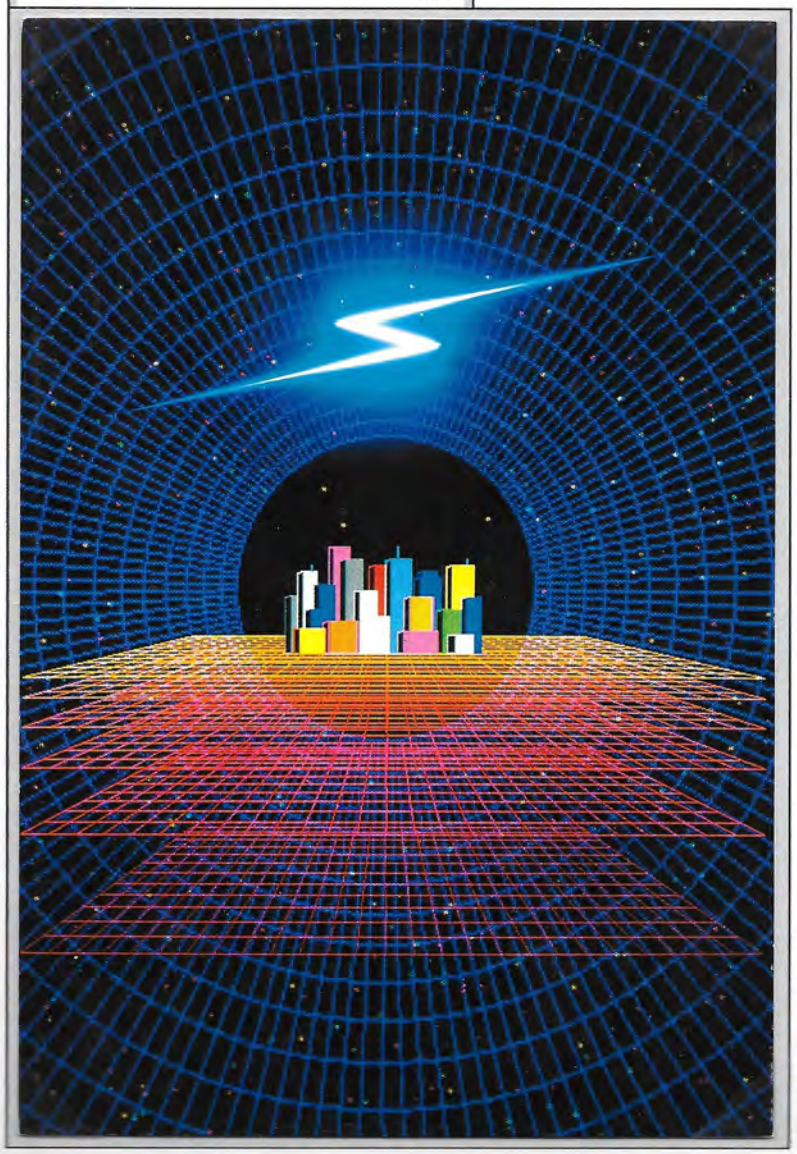
Graphical products

Analytical products

Users need all kinds of tools (statistics, analytical and graphical) ready to reply on various business questions and preferably with quick response times.

'Kinderpostzegels' (Netherlands); look-a-like early version paint software of Windows

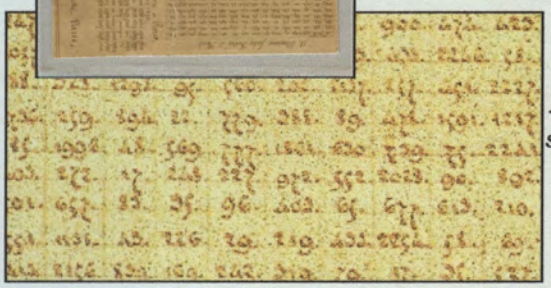
The graphical capabilities of a computer we learned to know in drawing tools such as Paint or Photoshop programs. Graphic design tools are very useful for visual communication and effects, as well in problem-solving research and developments. Julia set fractal visualization is for example very much used in chaos theory and generation of various models.



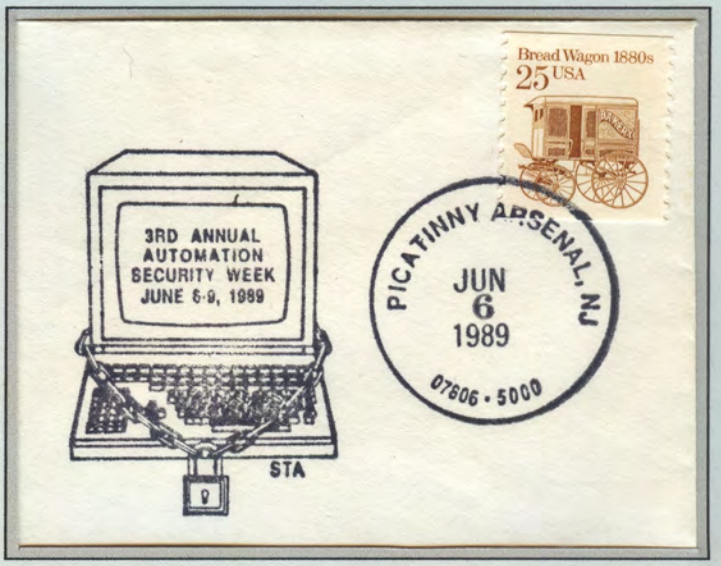
The commercial industry and the film industry deliver spectacular generated images. 'Toy Story' is the very first full length film where all characters and environments are completely developed by computers. Only a few manual interventions were needed, like mud on a car, spot on a wall, scratches on the parquet floor, etc.

Computer security and protection of information became one of the hottest issues the last years.

◀ *Pigeongramme on photo paper: governmental flight done by Steenackers on 19 Oct 1870 to Jules Favre, French vice-president and minister of foreign affairs.*



◀ *Detail of pigeongramme: showing coded messages*



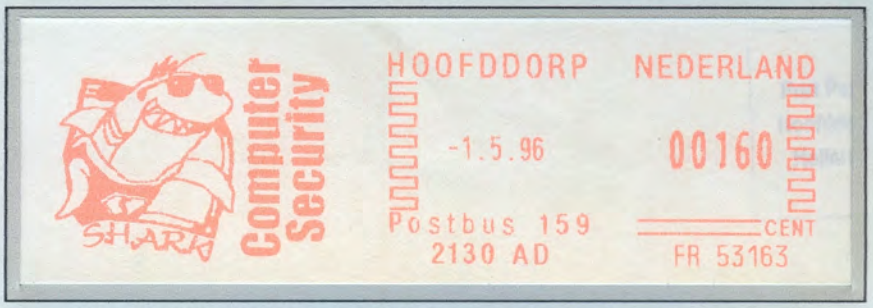
Already during the Franco-Prussian war in 1870 and the Siege of Paris coding governmental messages was introduced to protect the French pigeon post communication when pigeon felt in Prussian hands.

Also the Germans introduced network security during World War II. To protect their communications they used the Enigma, which was a machine capable to secure sending and receiving message, by using a primitive form of encryption.

US 6813th Signal Security Detachment APO 527 war cover sent from Bletchley Park: their task was more related to traffic analysis and cryptanalysis of their sources in the field like Enigma, Morse and radio messages. Sgt. Earl W. Swanson was hosted in Hut Six in the log reading section dealing with all incoming messages.

British mathematicians, like Turing, and with the help of Polish resistance, French and Americans were able to break the code rapidly. This makes encryption one of the weakest links in a fully secured chain.

Fingerprint protection



Francoptyp-Postalia "T1000" digital (Netherlands) - text: computer security

During the past years computer users throughout the world have fallen victim to a series of attacks (like sharks); hit by viruses or spoof mails, flooding computer systems with incoming messages, destroy systems or grab passwords. Therefore computer systems and Internet are since a long time protected by passwords, or since recently replaced with fingerprint protection or encryption of data.

Booklet (France): 6 of 20 stamps Marianne de Béquet 80c: partial printer quality. Text : "Mot de passe"= password

Internet represents an insecure channel for exchanging information therefor Internet security is most wanted and checking transferred data will ensure the integrity.

Letter sent as "PD" from Christiania, Norway on 04.04.1874 to St-Brieue, France and arrived on 09.07.1874. 4 different values: 1 sk (green), 2 sk (blue), 4 sk (brown) en 8 sk (red); representing of the algorithm of Hamming code the bit positions that are a power of 2; 2^0=1, 2^1=2, 2^2=4 and 2^3=8.

One of the most used algorithms is the algorithm of Hamming code. It is simply the use of extra parity bits to allow the identification of an error and even repair it. The bit positions that are a power of 2 are marked as parity bits (1, 2, 4, 8, etc). Each data bit is included in a unique set of parity bits, as determined its bit position in binary form.

Pitney Bowes-GB "6600" (Sweden): text: secure internet solutions

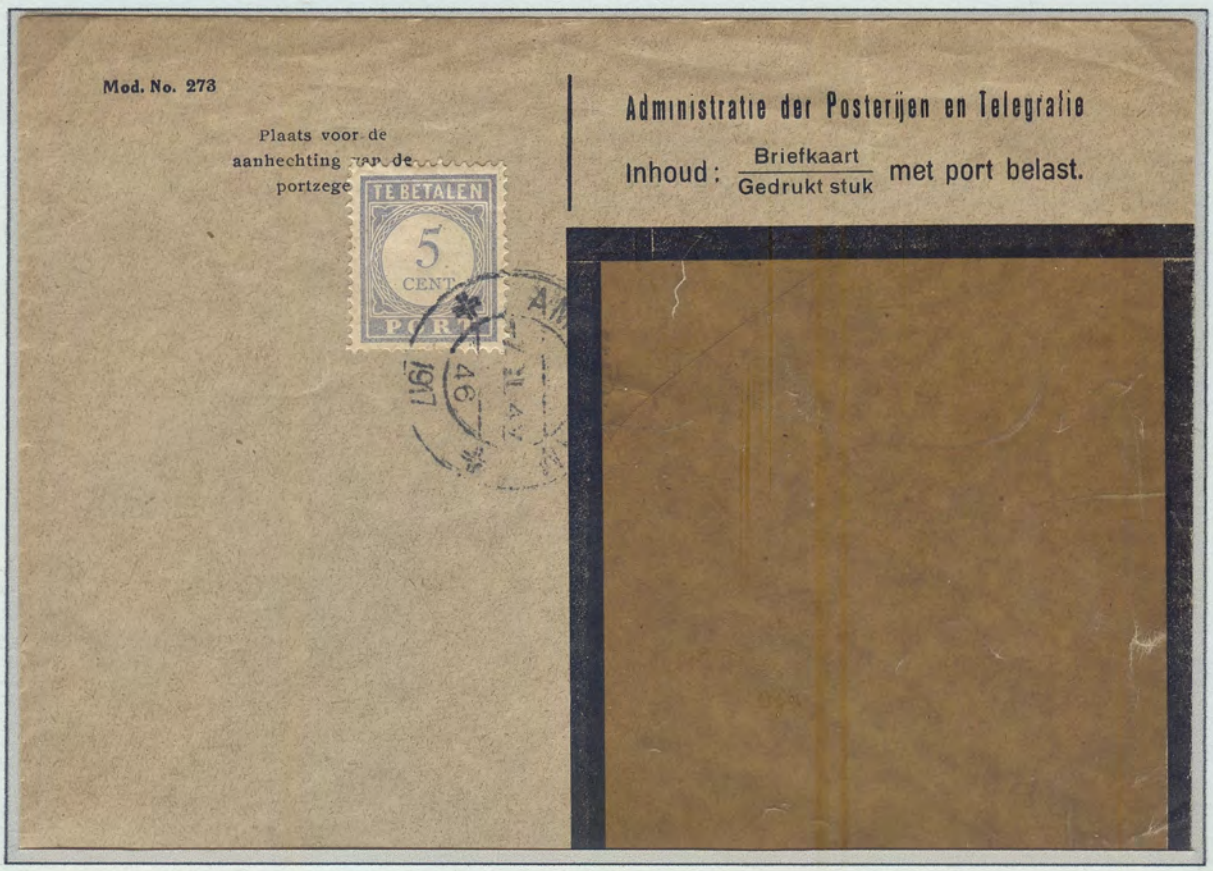
Computer and internet security is implemented in various ways already since the very beginning. Effective cyber defenses ideally prevent an incident from taking place by proactive approach.

Cyber defense ▶

'no' to copying

Text: Data Protection Agency

Data needs more protection, regulations installed against copying and distributing software. The Data Protection Act (DPA), now replaced by GDPR, is a law passed first by the British government and later European Commission, that sets out rules for those who use or store data about living people and gives rights to those people whose data has been collected.

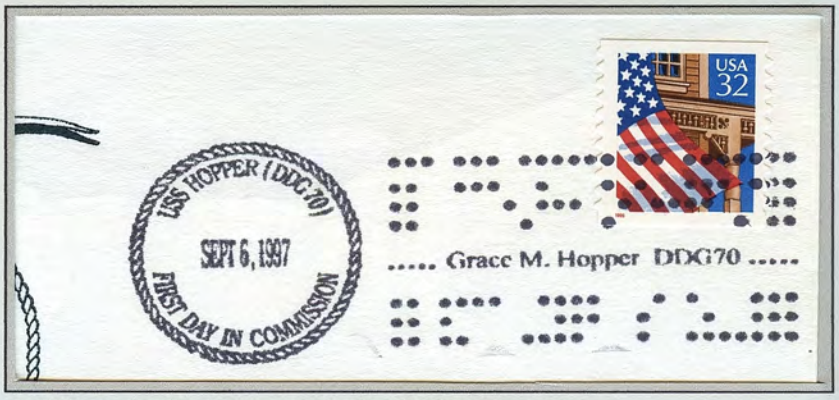


Postage due envelope (Netherlands - 1917): when a postcard was insufficient prepaid, it was presented to addressee in this envelope to pay the postage due. It prevented a common habit to read the message on the card and then refuse the card and this way to avoid paying for the postage. People are always in search of avoid paying for services.

Since the introduction of the PC at home. people were keen in finding free software, often illegal, as they always have tried to do. Still today video and music illegal downloads are a major problem.

A computer can only do the tasks for which it is programmed. When errors are detected, they are usually programming errors, "a bug".

Grace M.Hopper



USS Hopper ship (US); named after Grace M.Hopper

During the Mark-II programming project (1947) a navy maintenance engineer, **Grace M. Hopper**, defined as first a computer error as "bug" in a maintenance log. The little **moth** that got stuck in the relay and prevented working...

...correctly, got its immortality with its death. The **millennium bug** is the most famous year 2000 software problem.

'Poached Egg' Testing dummy labels (Great Britain - 1937); testing is vital to ensure smooth running. These labels were designed to enable Post Office engineers to simulate a live environment.

A computer program need testing and proof that it will run fine in all scenarios.

Letter Paris to Brussels (13.08.1777); cancelled with PARIS (Paris infinity cancel); used from April 1774 till May 1778

When badly tested, it can lead to a program looping endlessly or infinitely, either due to a program logic error (bug) or caused by wrong input or instructions. It results in computer "freezing"; others include thrashing or deadlock.

In the beginning programmers chose for a readable two-digit year date format when dates were stored on very expensive hardware. In the approach of the year 2000, trillion lines of code or records needed to be corrected and tested when date calculations turned out to be wrong and could cause errors.
'Year 2000 (**Y2K**) ready' means that a computer program performs date calculations correctly.

Baroda Philatelic Soc. Silver jubilee celebration cancel (India – 01.01.2000): depicting PC in new Millennium to share awareness of tangible chaos across the world. ►

A millennium bug could have caused chaos and by missing vital elements such as energy and products, business could have come to a halt.

◄ *copy of backside of stationery printed to order (Germany): postmarks on 31.12.99 and 1.1.00 with no century notification.*

Computers can't interpret automatically when a date is 100 years older. Above two-digit year date postmarks prove that only a human brain is able to detect the difference between 31.12.99 and 01.01.00. Computers can only interpret a four-digit year date format correct.

Occasional postmark (Germany): 5.9.1990.
4-digit year date format causes no misinterpretation.

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4

Communication developed to a world wide web.

4.1 The first telecom moguls.

Set-off print; reversed print on another sheet

A courier network was set up to deliver messages within a certain area for a set length of time. Private traffic required in many cases licence from the government. Postmen on horses were till 1800s the quickest way to send mail.

Cavallini (Kingdom of Sardinia, Torino - 14.08.1819) Pre-paid tax cancel (15c - short distance) on paper that allows pass through private post **(e)** ►

post courier on horse

Roman signal towers (left) and Chappe telegraph tower (right).

◄ *Die proof in black (Monaco) designed by Bétemps*

Till a French inventor **Claude Chappe** (1763-1805) demonstrated a practical semaphore message system in 1793.

By 1846 the Chappe telegraphically network spanned all of France with 556 stations and 5000 km of lines. This was the first practical mechanical wireless 'internet' and was based on the Roman signal towers and practical use of a telescope.

Partial perforated block of 6 ►

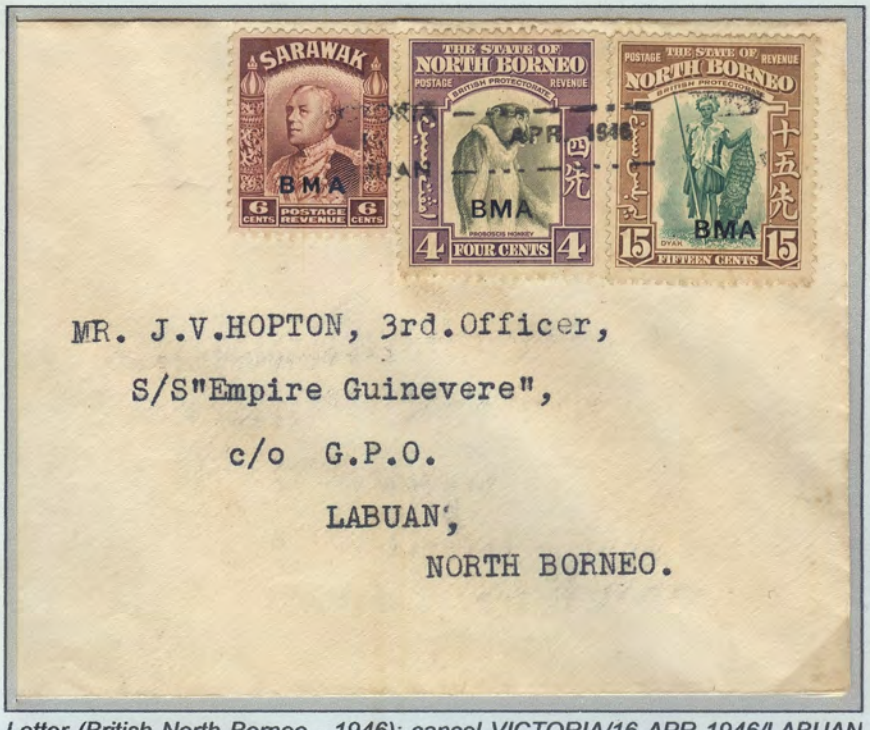
Chefoo Local Post – 1859 ▶
Smoke tower transformed

An electric version was put in place quickly after, and in 1855 transformed to an electric telegraph network. The first 'electronical mail messages' was a fact and the race for faster and very broad network started.

Morse code ·– - = V ▶

Morse code, invented in 1836 by **S. Morse** (1791-1872), was used in wireless telegraph messages transmissions via airways, a solution adapted from submarine communications.

Color proof (New Caledonia)
Morse code receiver



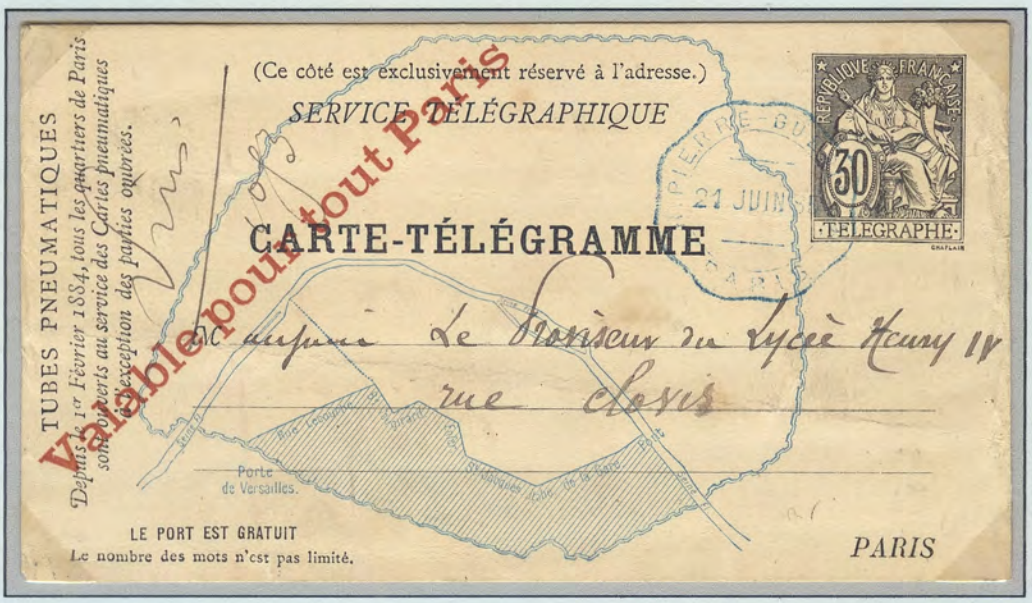
Letter (British North Borneo - 1946); cancel VICTORIA/16 APR 1946/LABUAN
text in Morse code: -... -- .- = BMA

shifted perforation

SECAP "N" with prefix N (France)

copper wires strung on wood poles

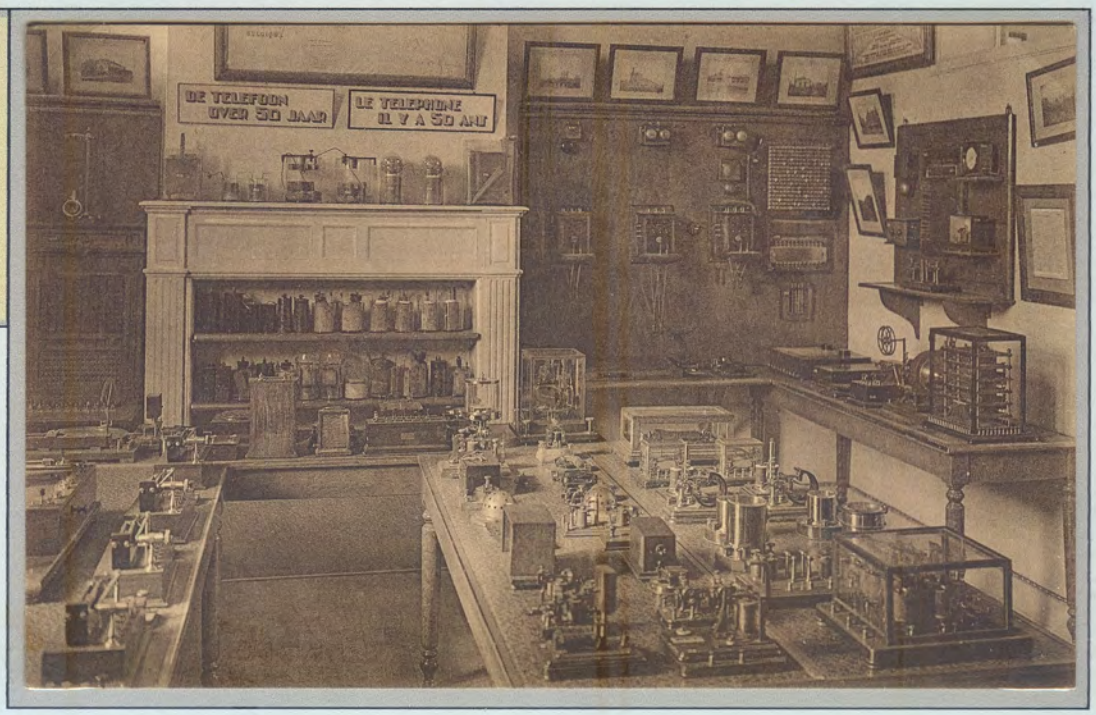
All across the country those long-distance telegraphs were once carried on bare copper wires strung on wood poles with glass insulators. The telegraphs messages were printed by a tele printer interpreting the pulses sent.



◄ *Pneumatic telegram (Paris, France - 1895)*

Another major network of tubes in Paris was able to deliver **pneumatic mail;** a system to deliver letters through pressurized air tubes. It was in use since 1866.

Change after change came rapidly and expansion of the wired network grew fast and gained economic importance.



Telegraphing and Morse code reception equipment displayed in Brussels Post Museum (1880-1913) ►

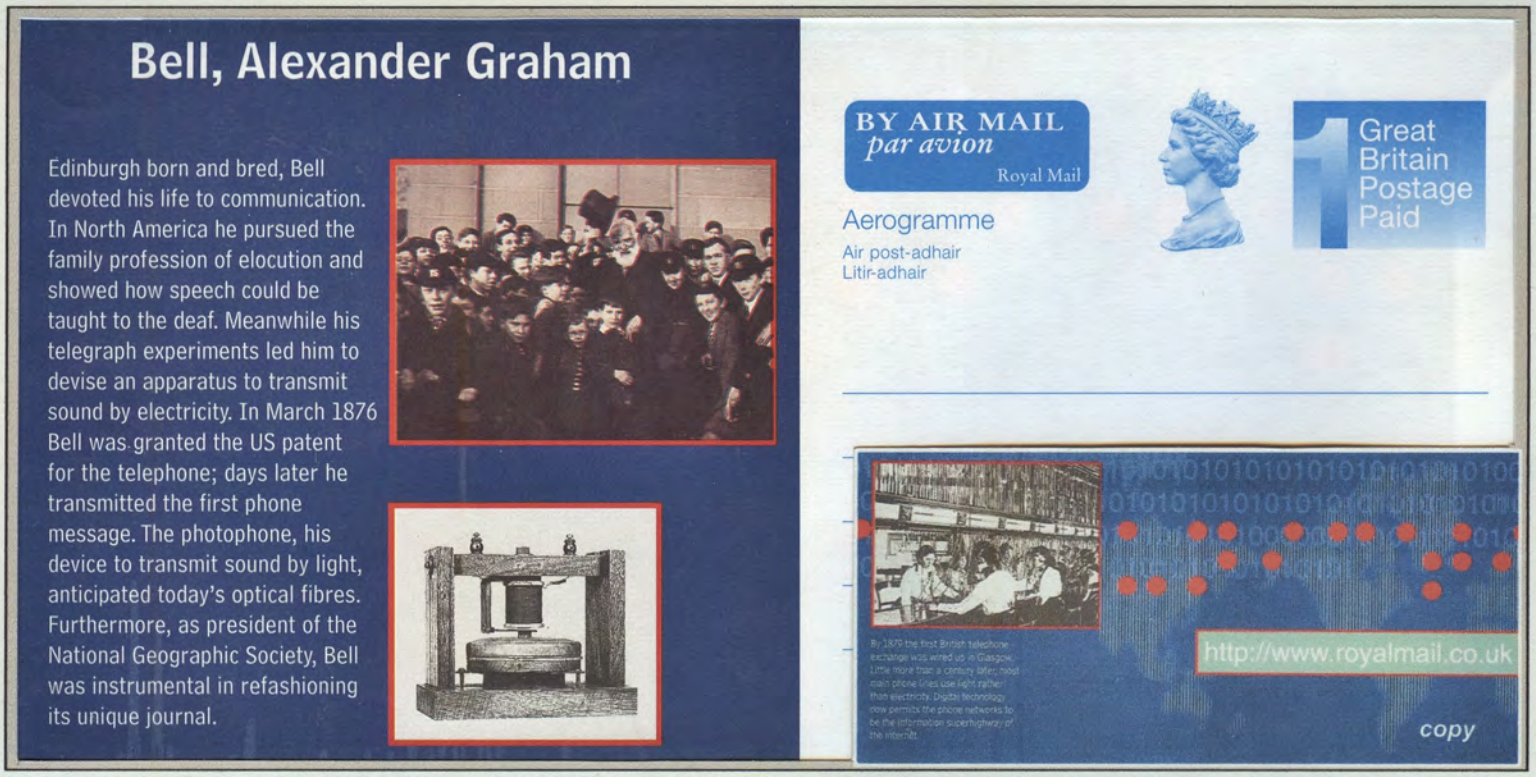
*Inflation letter (Germany) sent in 1923 from Siemensstadt to Duisburg (city nearby Berlin named after Von Siemens' company). Perfin SSW (**S**iemens-**S**chuckert **W**erke)*

Proof of studio (Paraguay): ill. first telegraph lines in 1860.

Werner Von Siemens (1816-1892) installed the first telegraph lines between Frankfurt and Berlin in 1848, and in Russia in 1850. With his brothers he went on to install lines between India and Europe, as well as across the Atlantic. Not only the Siemens company is named after him but also a whole city was named after him; ***Siemensstadt***.

Émile Baudot (1845-1903), French telegraph engineer and inventor of the multiplexed telegraph system, which means that multiple transmissions could be sent over a single line.

Alexander Graham Bell (1847-1922) was an eminent scientist, inventor, engineer and innovator, known for inventing the first practical telephone, by sending multiple tones on a telegraph wire. He also made groundbreaking work in optical telecommunications.

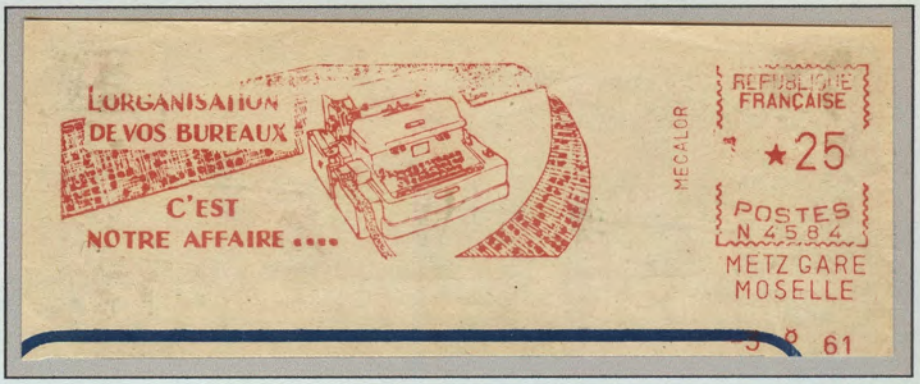


Aerogramme (Great-Britain) - Graham Bell stating; "The photo phone, his device to transmit sound by light. … a century later, most main phone lines use light rather than electricity. Digital technology now permits phone networks to be the information superhighway of the internet".

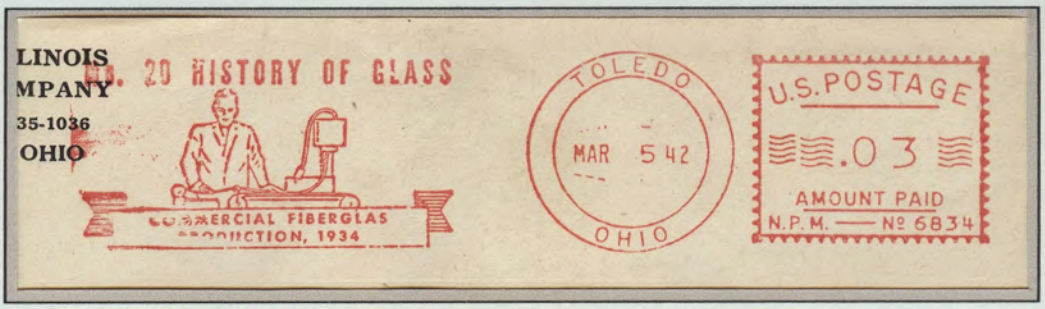
Telegram (Polish) 21.10.1927: Publicity Ericsson telephone and cable

Ericsson's company history dates back to 1876 when the founder, **Lars Magnus Ericsson** (1846-1926), opened a repair shop for telegraph equipment. Realizing that there was a need for improvements in the telephone instruments available at that time, he started his own production. He invented a switchboard to handle the growing number of telephones and lines. They also tried a few years in 1980-90 to sell PC's, but found out that their core business was selling telephones.

Telegram (Czech): Central equipped with telephone switchboard based on Ericsson model.



The telex network used the telephone network was extensively used worldwide by companies from the mid-1920s till the end-1980s. Telex machines could connect with and communicate with any other telex machines on a global scale and was also relatively secure in sending and receiving messages.

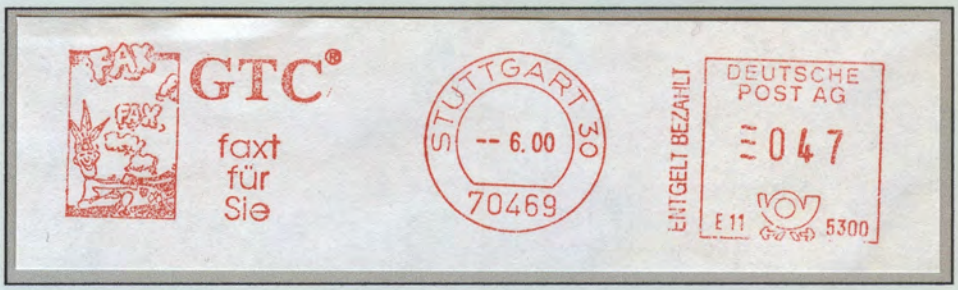


National Postal Meter multi-value (U.S.): early Fiberglass production

Until 1980s the entire telephone, telegraph and telex network was analogue. Today it is fully digital thanks to fiberglass, a product invented in 1932 for producing glass wool. The digital network protocol ISDN (Integrated Services Digital Network) became the standard allowing a copper wire or optical fiberglass (wire of glass) to carry fast and error-free voice, video and many other digital network services.

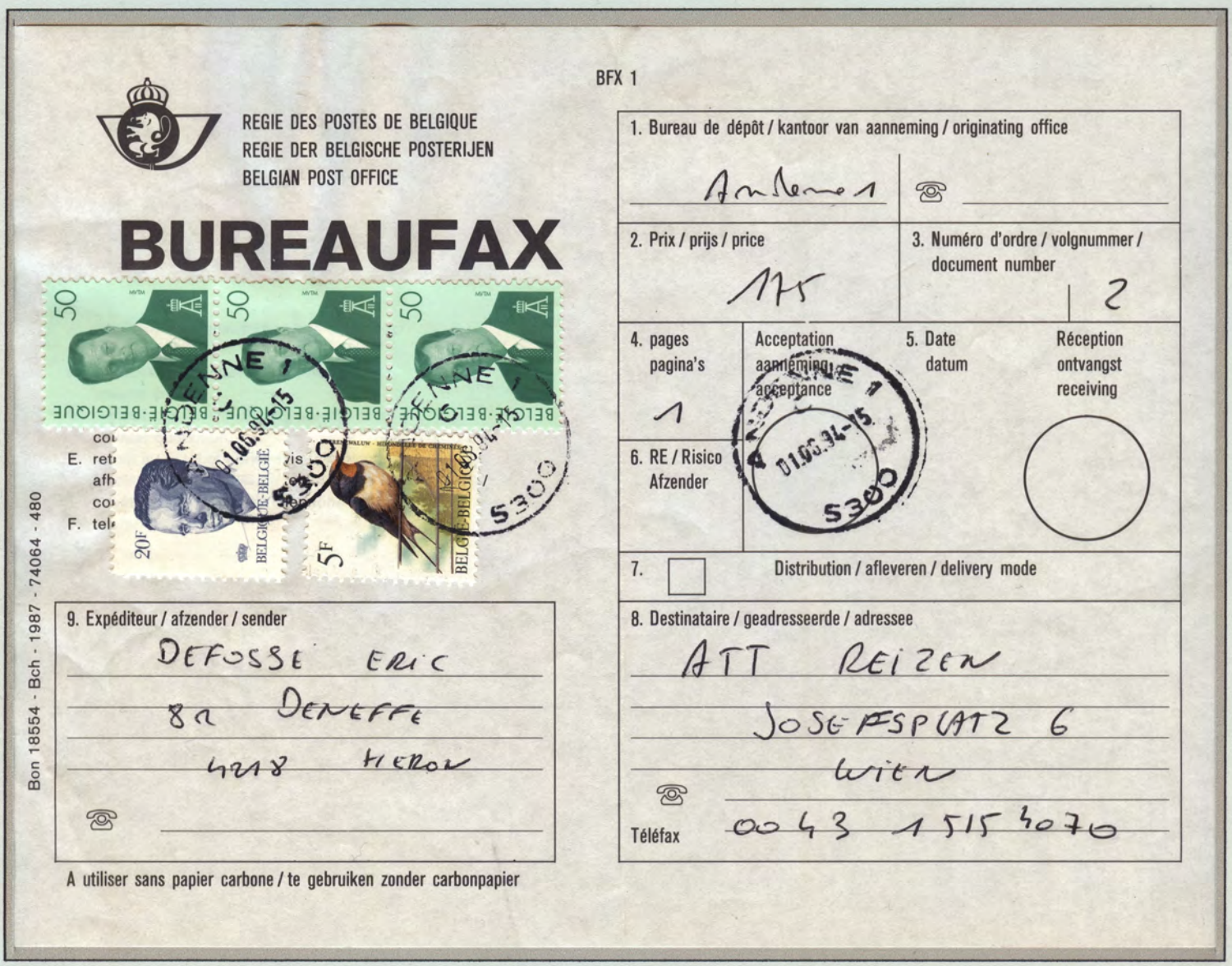
Telex punched stamp (Estonia-1991); Shortly after Estonia gained full independence, many post offices ran out of stamps. The city Tartu issued local provisional stamps on telex punch paper on 19 December 1991 only. They are never sold in mint condition and exist in sets of 16 stamps in three colours (white, light blue and dark blue).

4.2 Replacing the old copper network by fiber.

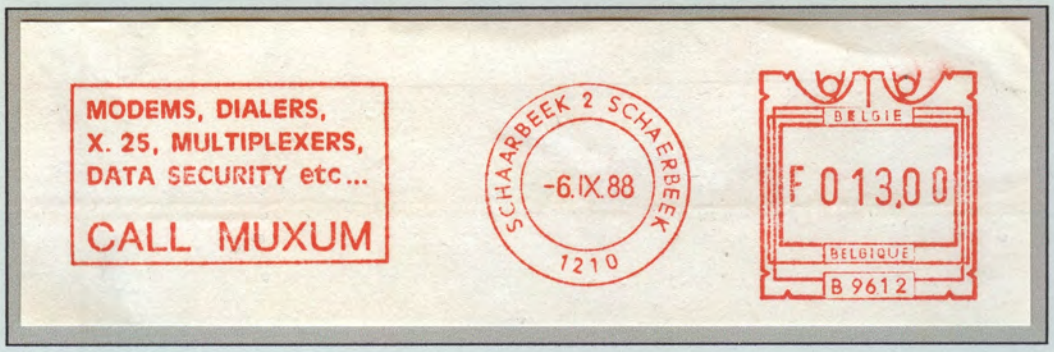


Pitney Bowes "6300" series (Germany): text: Fax messages

A fax machine makes a tele copy by scanning graphical pages including images and text, and converts the information into digital signals, transmitted via fast fiber lines to produce a paper copy of the graphics on the receiving fax machine. The growth in the market was prompted in Asian region by the pictorial nature of their language.



Telematic Fax service (Belgium) bureaufax document BFX1: serviced from 1 jan 1994 till 31 dec 1998 (national) – 31 aug 2001 (international). One page fax international sent (175BEF=4.33€) on 01.06.1994 from Andenne to Vienna (Austria).



The goal of a **modem** (constructed from ***mo***dulator and ***dem***odulator) is to (re)produce a signal containing data that can be transmitted fast. Different transmission protocols (shapes of packages sending a stream of bits) guarantees higher speed, availability, secured and quantity of bytes.

Cyan color proof ▶

For long distance communications applications a satellite in a geostationary orbit appears the fastest way. Since 1964 hundreds of communication satellites are in use worldwide.

Artwork (North Korea): satellite, satellite dish and man checking a terminal.

Satellites were introduced where wires weren't easy to place or to get. With satellite dishes pointing to a satellite easy transmission can be established served by radio waves over long distance without limits on capacity.

Specimen ►

◄ *Artwork (Tonga): telecommunication*

Die proof in black

Modern communications satellites provide a technology complementary to communication cables. They are the ultimate solution for mobile applications in transport area such as: trucks, ships, planes or rockets. A cable is just impractical or impossible.

LGRAM SERVICE CENTER
IIDDLETOWN, VA. 22645

POSTAGE PAID BY SENDER

stern union **Mailgram**

UNITED STATES POSTAL SERVICE
U.S.MAIL

MAILGRAM WAS TRANSMITTED ELECTRONICALLY BY WESTERN UNION SATELLITE

WILFORD WATSON
106 SIXTH AVE APT 4
MENOMINEE MI 49858

FIRST MAILGRAM TRANSMISSION VIA WESTAR,
FIRST DOMESTIC U.S. COMMUNICATIONS SATELLITE,
SEPTEMBER 6, 1974

*A **mailgram** is a type of telegraphic message which is transmitted electronically from the sender to a post office and then printed and delivered to the recipient via postal means, usually the next day. In the United States, the Western Union Com-pany started mailgram service in 1970. This service via Satellite was introduced in 1974 and stopped as of August 17th, 2006.*

Photo proof; design Bonnevalle

Francotyp "Cc/Ccm" (Spain - 1972)

Pabx of ITT company

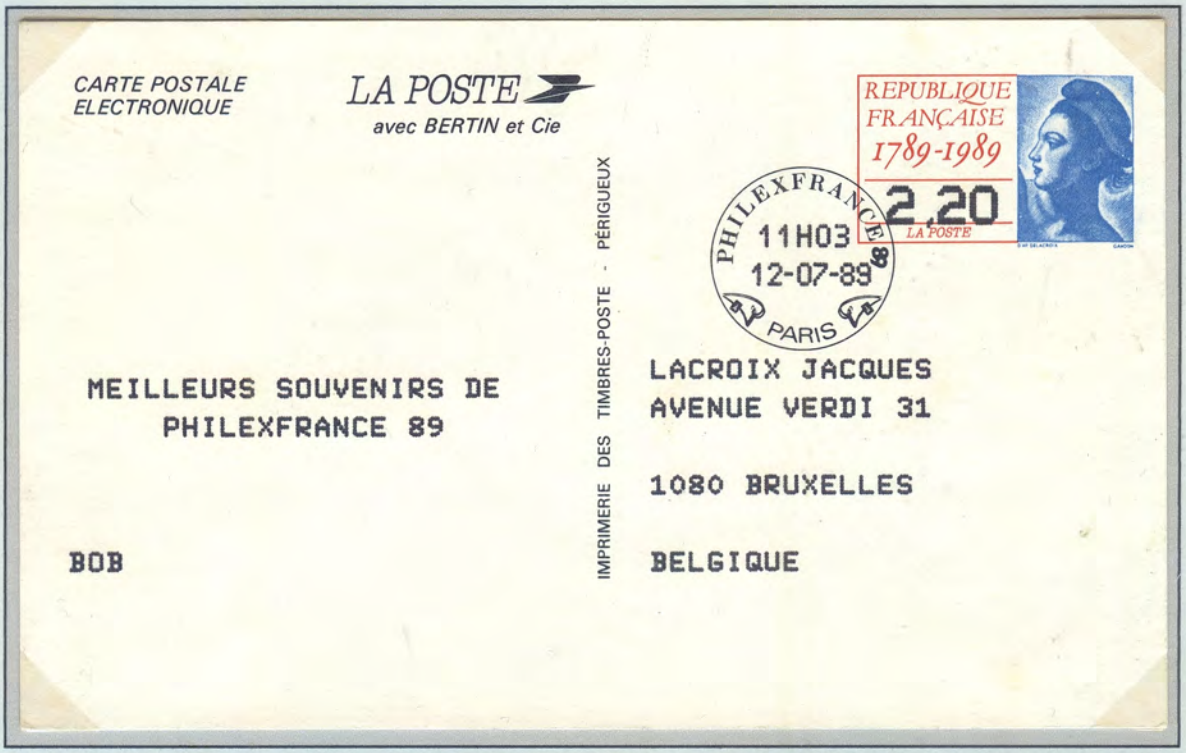
Historically we may not forget the **PABX** (**P**rivate **A**utomatic **B**ranch e**X**change), an automatic telephone switching system within a private enterprise. Such devices were used to establish early telephone networks and switch digital information among computers and office devices.

Local area network

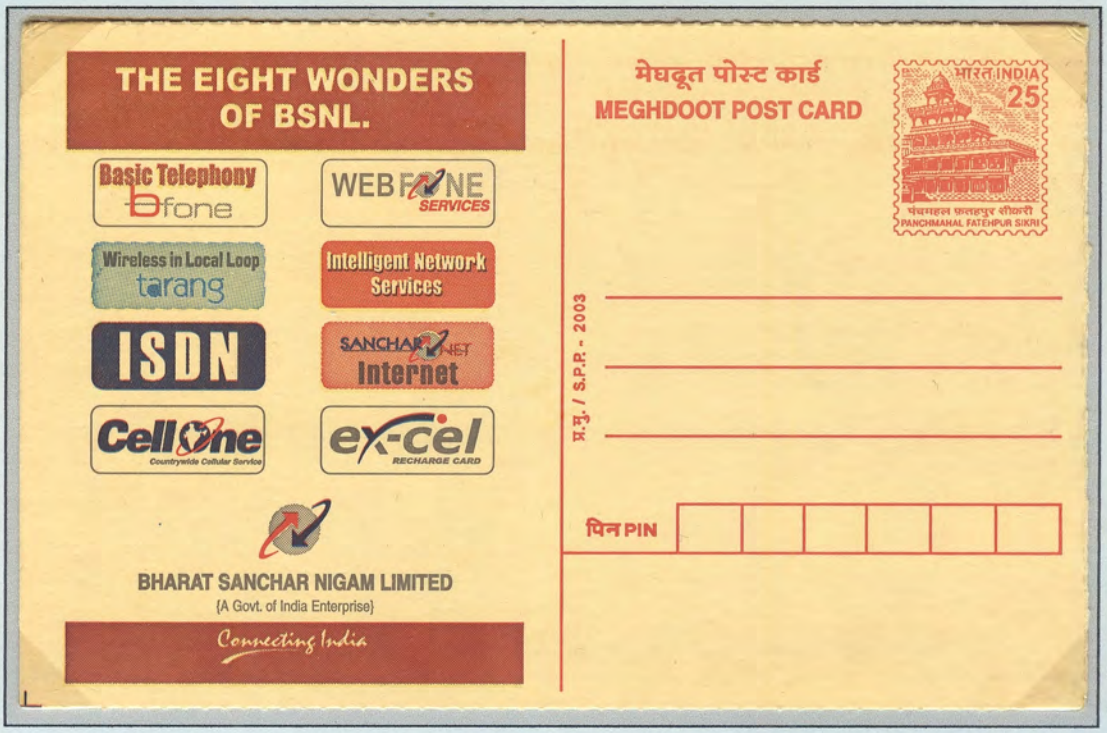
Hasler "Mailmaster" (Germany)

Local area network

A LAN (local area network) connects workstations and personal computers and allows users to share devices, such as laser printers and storage. Users can also execute programs any-where on the network and communicate with others by sending e-mails or engaging chat sessions.



During the World Stamp Exhibition PhilexFrance '89 in Paris a network of 50 terminals and 2 central printers was set up. A pre-printed postal card was sent after printing the typed in address, chosen preferred message out of 4 standard ones, paying the calculated rate depending on the address and the date time stamp.

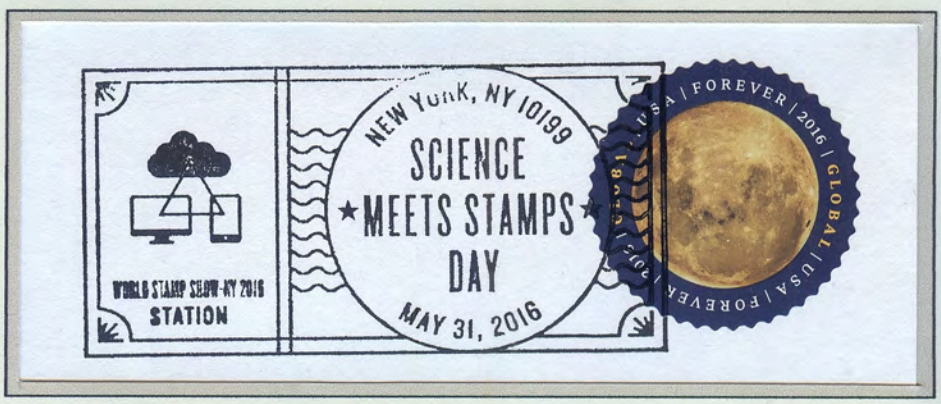


◄ *Meghdoot stationery (India)*

While lines for telephone are less in use due to mobile telephony, those lines are now in use for ISDN and DSL activity that allows the user to access the Internet at home.

Connectors

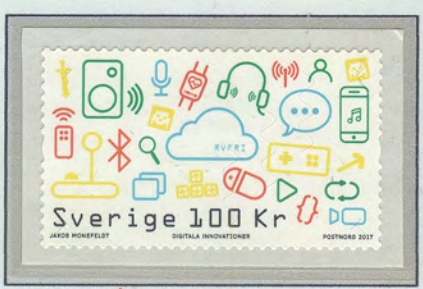
Wi-Fi connection



Wi-Fi and mobile connectivity thru wireless access introduced internet access in the Cloud; being "Cloud computing" and sharing data and software provided by service providers.

Bluetooth is summed up by this runic inscription from the Jelling stone.

Bluetooth is a wireless technology standard for exchanging data over short distances using short-wavelength and allow mobiles to link easily.
Bluetooth is an invention of Ericsson Company and gave it the name of a King called Blåtand who lived in the 10th century and united the Nordic countries.



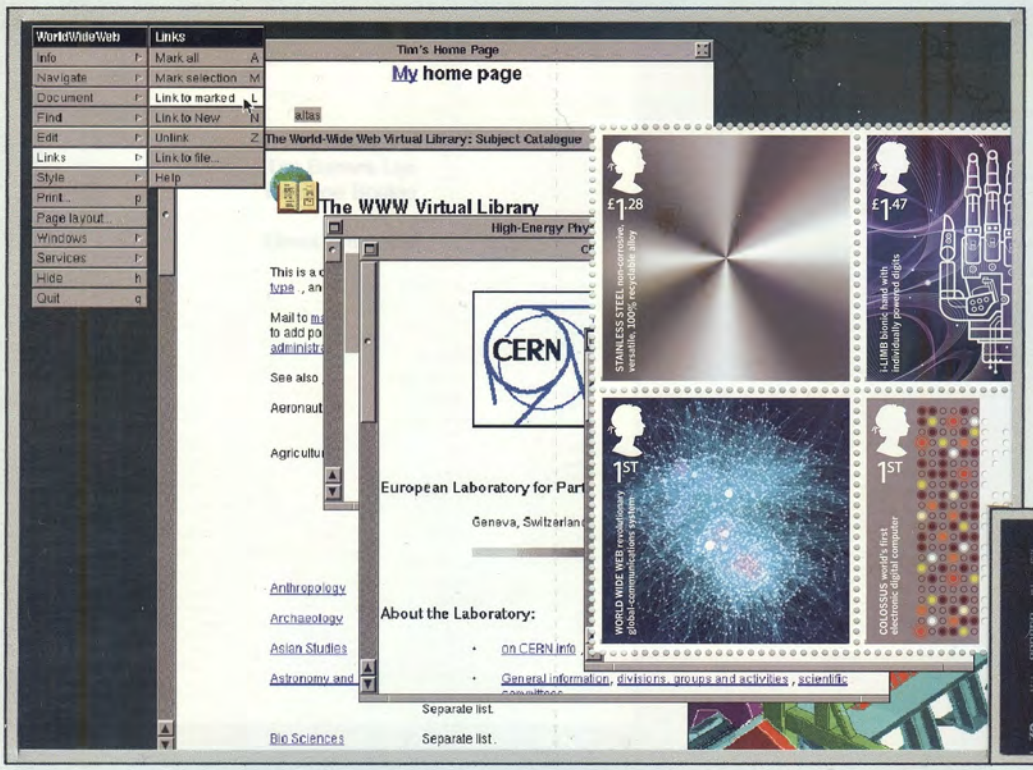
Bluetooth symbol

4.5 Wonderland Internet, one big world!

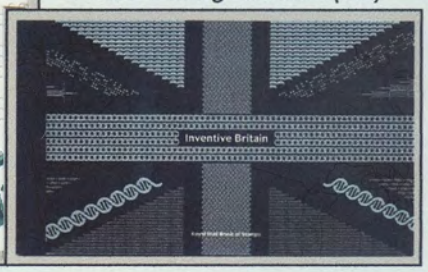
Invented by Barners Lee

The current global Internet was developed for the US Department of Defense as a reply to the atomic threat of the 70s. The goal was to build a global communication network based on TCP/IP (Transmission Control Protocol / Internet Protocol) to connect for non-commercial use.

Barners Lee



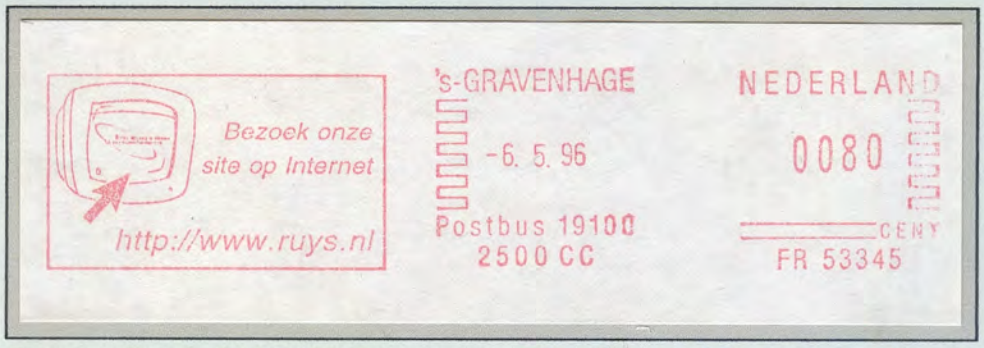
◀ *Pane Prestige Booklet (GB)*



Barners Lee invented the WWW (World Wide Web) by using the HTTP (Hypertext Transfer Protocol) client en server via the internet. The first successful communication was in Christmas 1990 while he was working at CERN. The language developed for this is called HTML (HyperText Markup Language) using hypertext and hyperlinks (link or URL; Uniform Resource Locator) for immediate access via displayable links.

Internet became commercial and caused a drastic impact on culture and commerce.

"Surfing the Internet" is a common expression; exploring the internet by following one interesting link after another, usually without a definite objective or search strategy.



Francotyp-Postalia "EFS3000" (Netherlands) URL with text: visit our site on Internet

An Internet café

The Internet, the worldwide web, became available everywhere in the world, both thru privately or company connectivity. It became popular due to the published information and advertisements against payment, the start of first commercial use and need, in an easy way.


: 10 centimes.

UOTIDIEN Vendredi 4 Mars 1881

URRIER

-ET-LOIRE

PRIX DES ANNONCES

La ligne d'environ 35 lettres . . . . . 20 cent.
Annonces répétées . . . . . 15 —
Réclames à la troisième page . . . . . 25 —

BUREAUX

1, rue Fructidor,

CHALON-SUR-SAÔNE

Typographic cancellation (France - 1881)

commercial advert against payment (text: Prix des announces)
comparable with the first commercial use against payment on the internet

Every country and global network groups got their own extension (top-level domain like .com).

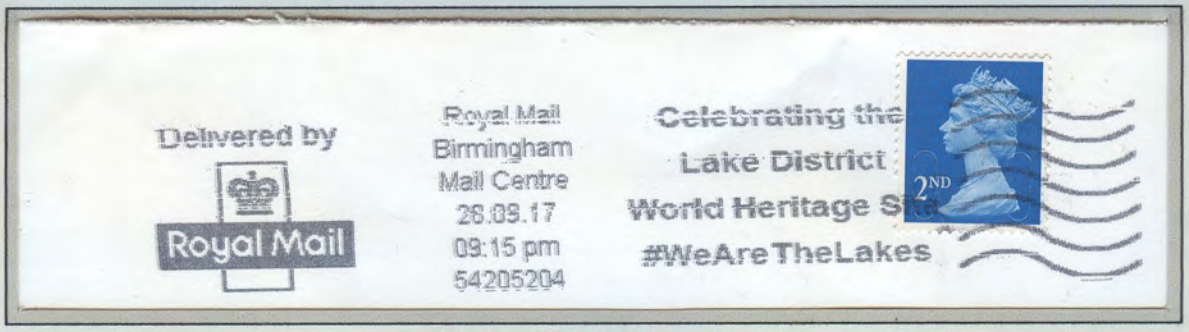
◄ as an exception television channels wanted to have their own extension; they offered in 1998 the small country Tuvalu $50 million for using the .tv extension until 2048.

Internet URL from
Vietnam government
http://www.thudo.gov.vn

◄ *Francotyp-Postalia "T1000" (Germany)*
http:// protocol header, www. public prefix and extension .de for German URL

Electronic mail (E-mail)

Thanks to Internet the world is fully connected to each other by all kinds of technology so we can have the pleasure of sending E-mail (**Electronic mail**) automatically, or much quicker is Instant Messaging Software that allows chatting and offers real-time (online) text transmission.



Hashtag #WeAreTheLakes

Seabees V-Mail (US): Naval Construction Battalions (CB)

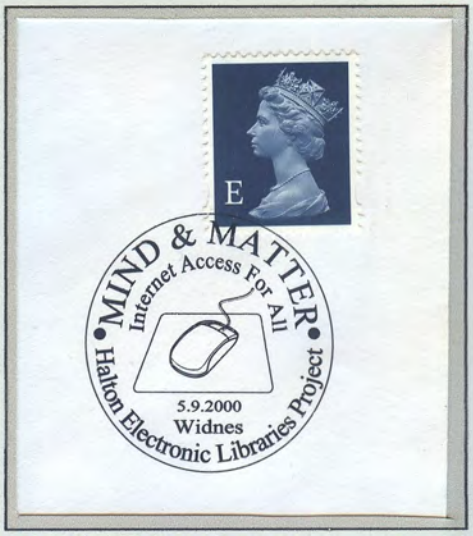
spam meat

You want to kiss someone

Billions of messages are sent every day and some Internet slang and symbols has been introduced like: BTW, kr, ;-), *^_^*, ^3^, etc.... ***emoji's, slogan hashtags*** and shortcuts save keystrokes for the sender.

emoji's

Spam was often misused to describe any canned meat product containing pork tasting horrible, all-over and inevitable, characteristics which led to its name being borrowed for unsolicited electronic messages, especially spam email.



The internet gives quite some wonderful possibilities to all of us such as; online shopping, e-business or e-commerce and all kinds of e-governance (government online services),.

@ : e-business or e-commerce sign

Today e-commerce trading (shopping) is recognized for its ability to allow business to communicate and to form transaction anytime and anyplace, where buyers or sellers rely on Internet-based technology.

Booklet (France) Phil@poste version: miscut (découpé à cheval) Web Shop for stamps: text: Buy your stamps and other products online and receive it at your place. Address: www.laposte.fr/timbres

◄ *Port freedom – Red Cross free Search Service for prisoners of war (Germany – 1949)*

if you wanted to know what happened to your relatives it took ages and it went by postal mail. Today they stay in touch thru Internet and Social Networks.

Billions of Internet pages, millions of websites and social media make it accessible and useful for everybody …

Block partial shown (Spain)
Icons social media for Twitter, YouTube and Facebook

Registered mail ticket (India – 2012) 14 years Google

… searching information.

Social media are computer-mediated tools that allow users or companies to create, share experiences, or exchange information, about interests, ideas, with or without pictures or videos in virtual communities and networks.

Booklet (France) Phil@poste version Web shop for stamp products: Join us on Facebook...