

# AI

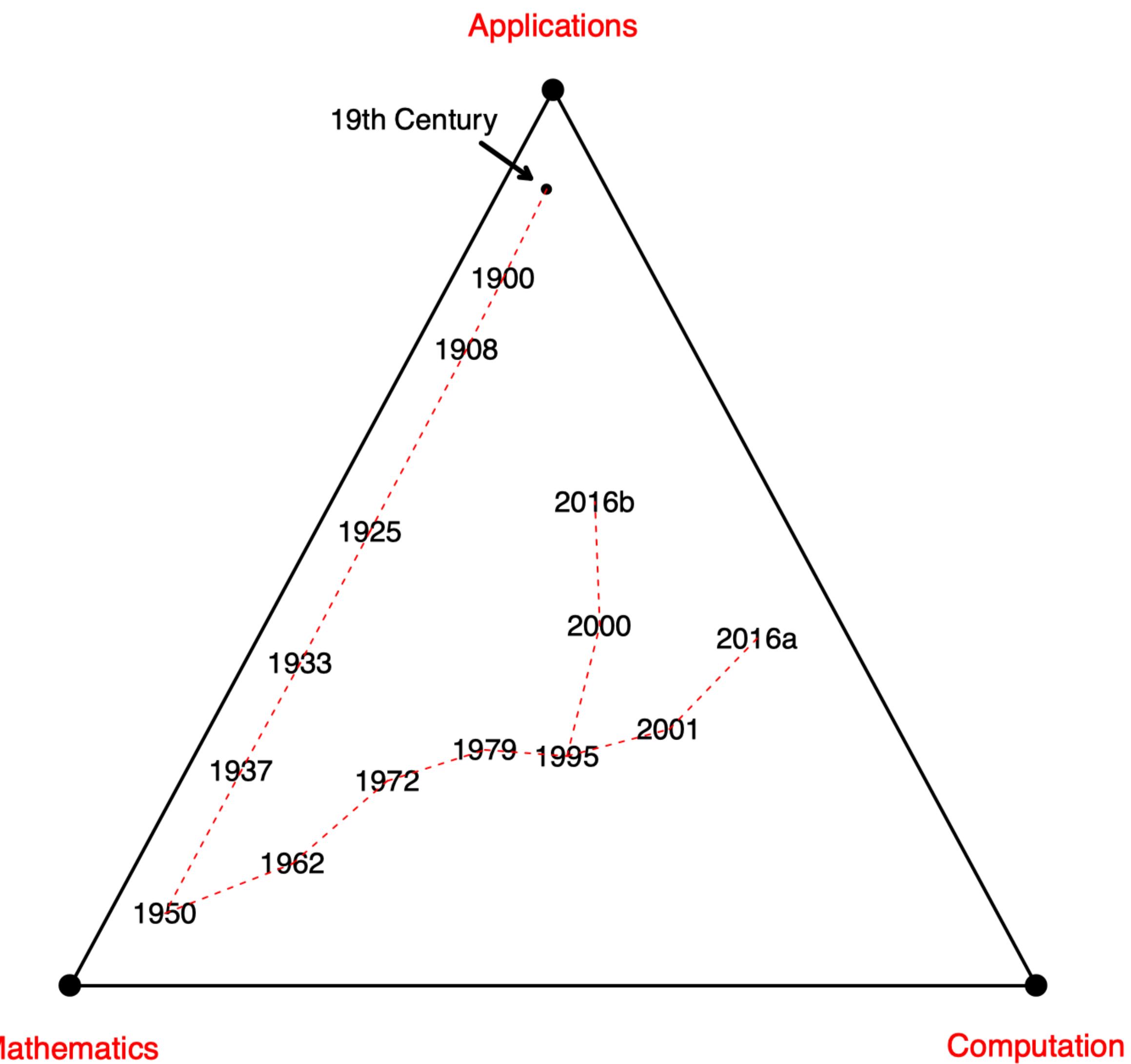
Amir Zare - Summer 2024

# **Chapter 1: History of AI**

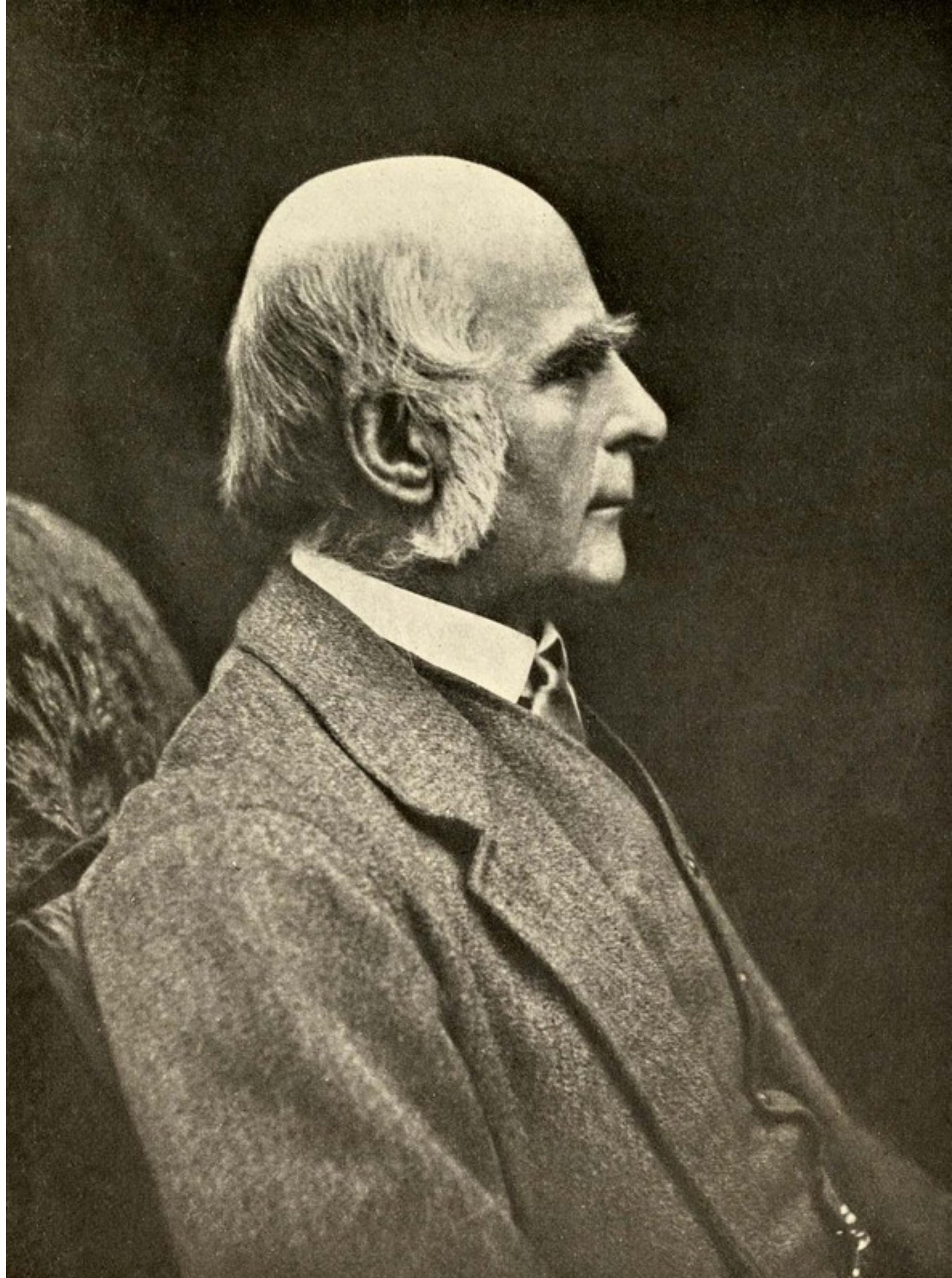
## **Why not just statistics?**

# Scene 1: Statistics





# **Francis Galton (1822-1911)**



# Karl Pearson (1857-1936)





Karl Pearson (left) wrote that black and indigenous people had “not yet produced a civilization in the least comparable with the Aryan” and that the white man should “completely drive out the inferior race.” Francis Galton (right) offered Pearson an endowed Chair of Eugenics at University College London due to his fears that “the race gradually deteriorates, becoming in each successive generation less fit for a high civilisation.”

# Ronald Aylmer Fisher (1890-1962)





From left to right: Ronald Fisher, Gertrude M. Cox, Frank Yates, and Besse Day at a gathering in Blue Ridge, North Carolina, 1952. Published in Box (1978) and used under the fair use provision, Section 107 of the U.S. Copyright Act.

## **John Wilder Tukey (1915-2000)**

Writes on “the future of data analysis” in 1961



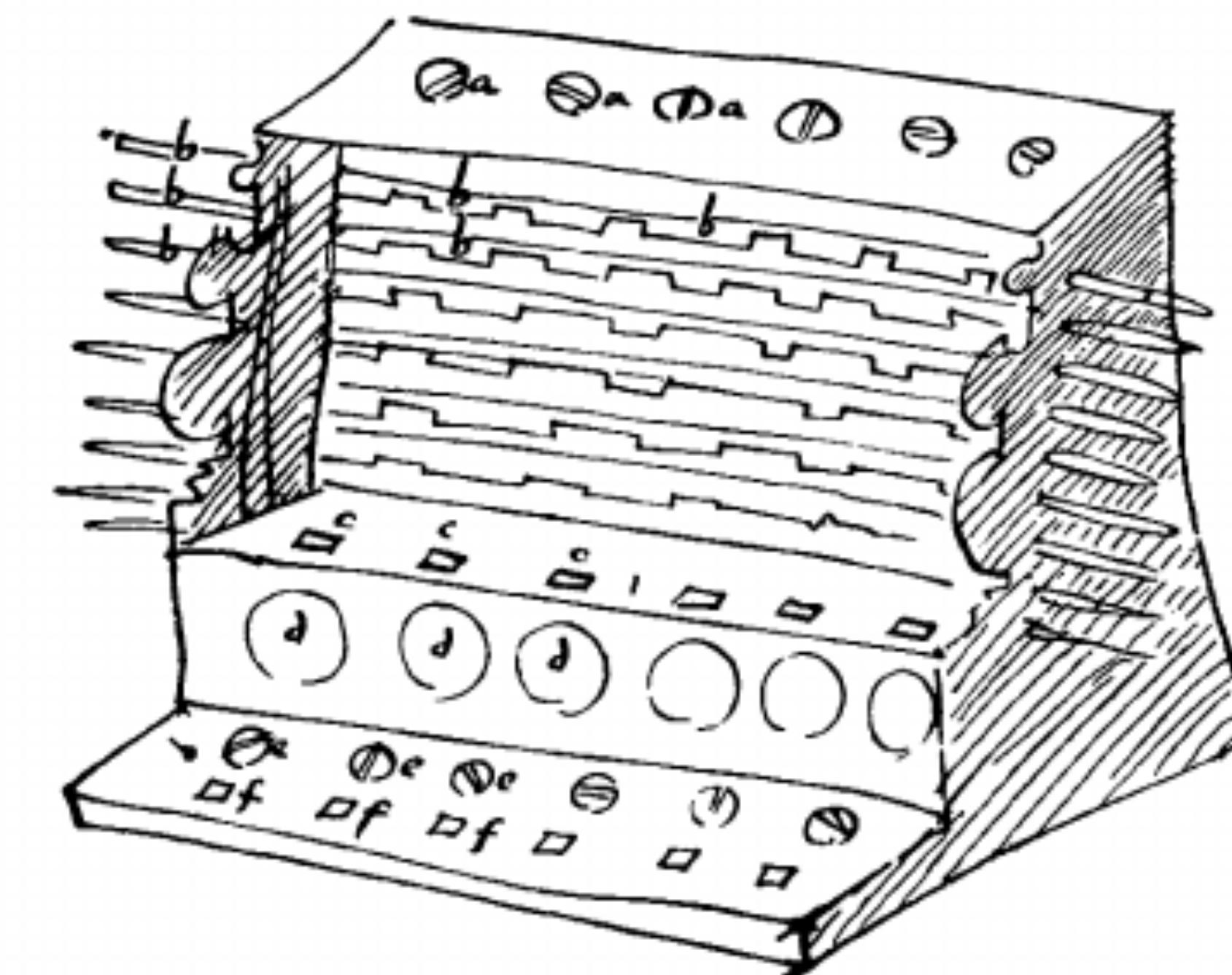
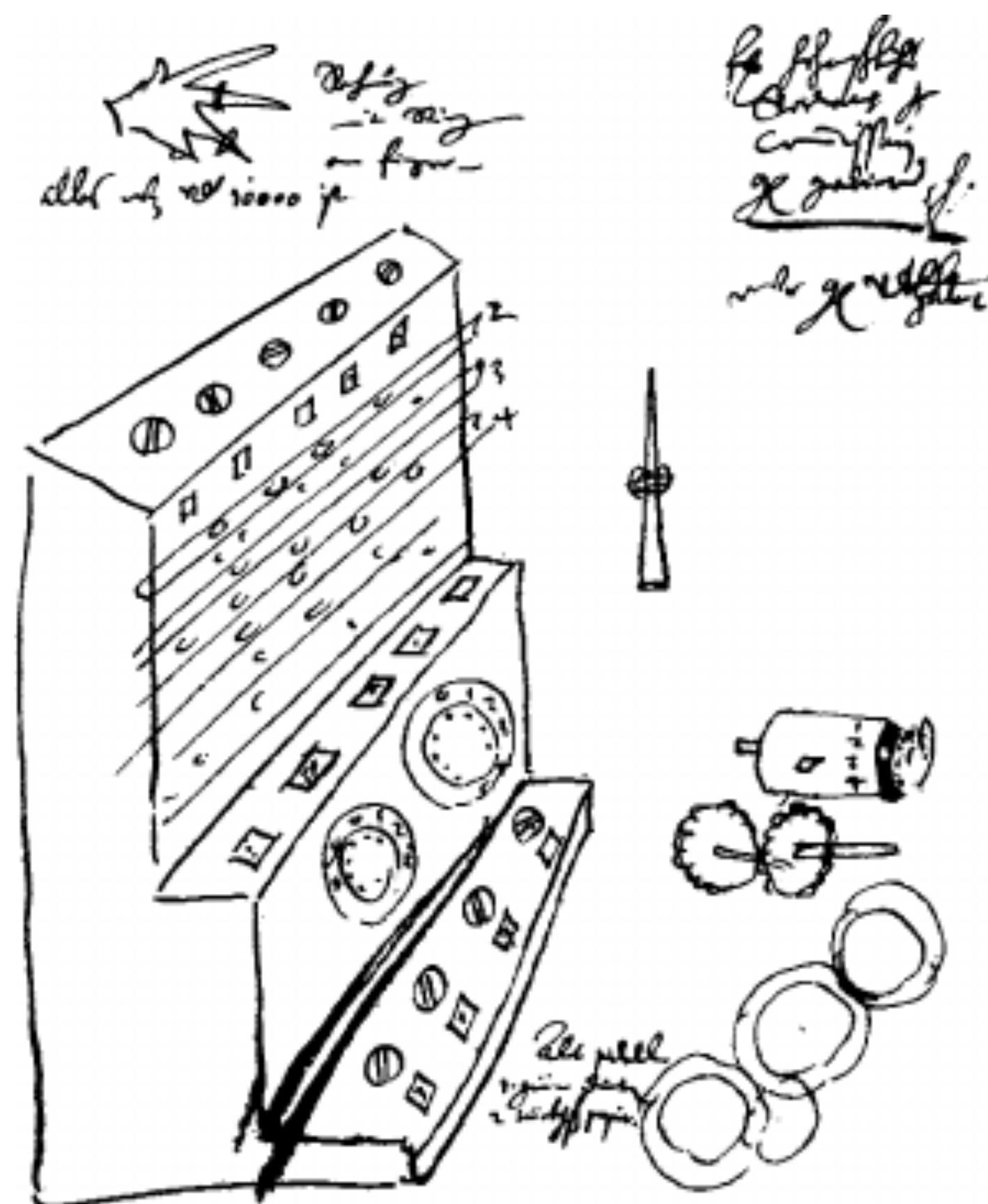
# Scene 2: Computation



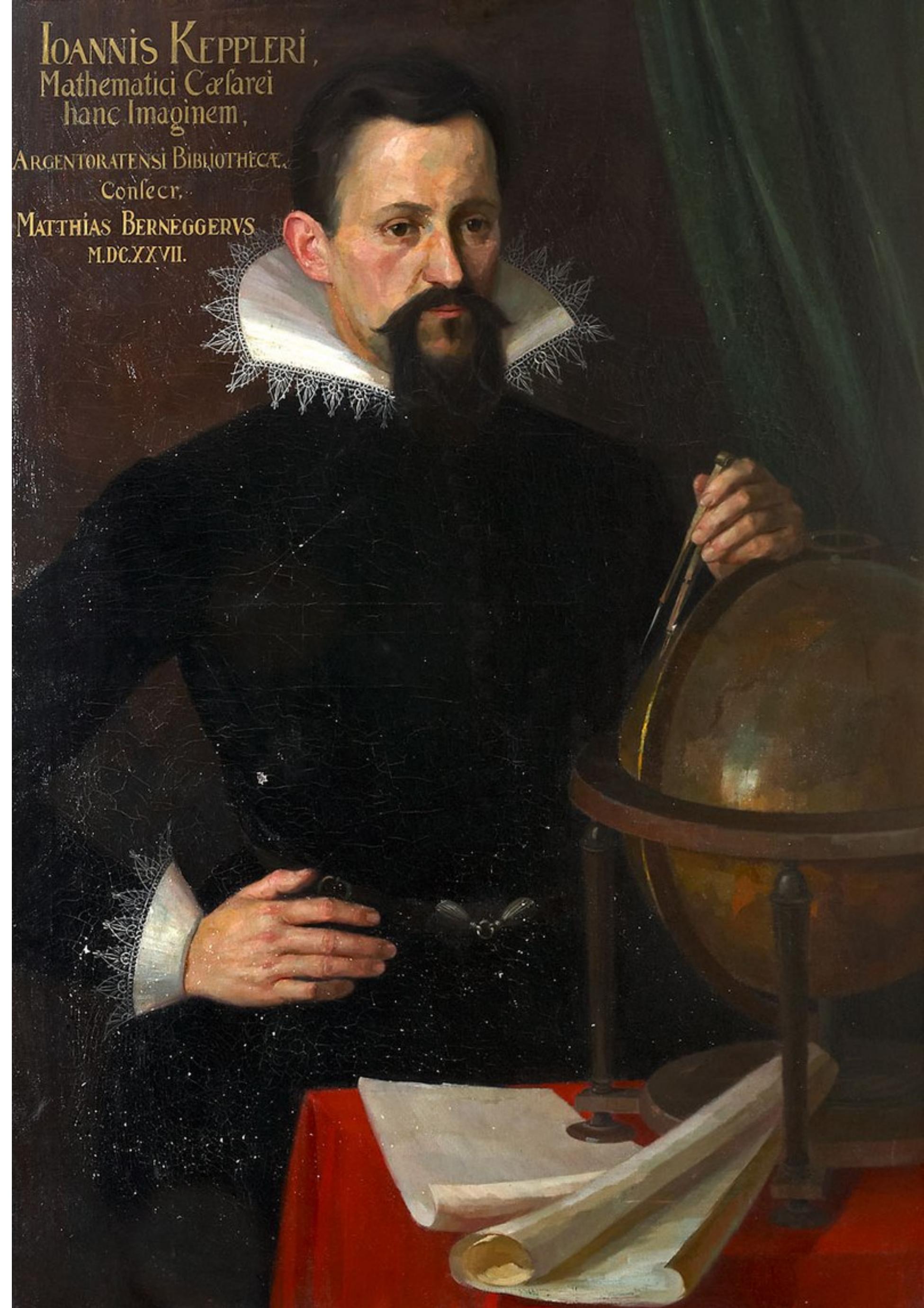
## Wilhelm Schickard (1592-1635)

Invented the first mechanical calculator. The original is not preserved. We only know of it from his letters to Kepler.





# Johannes Kepler (1571-1630)

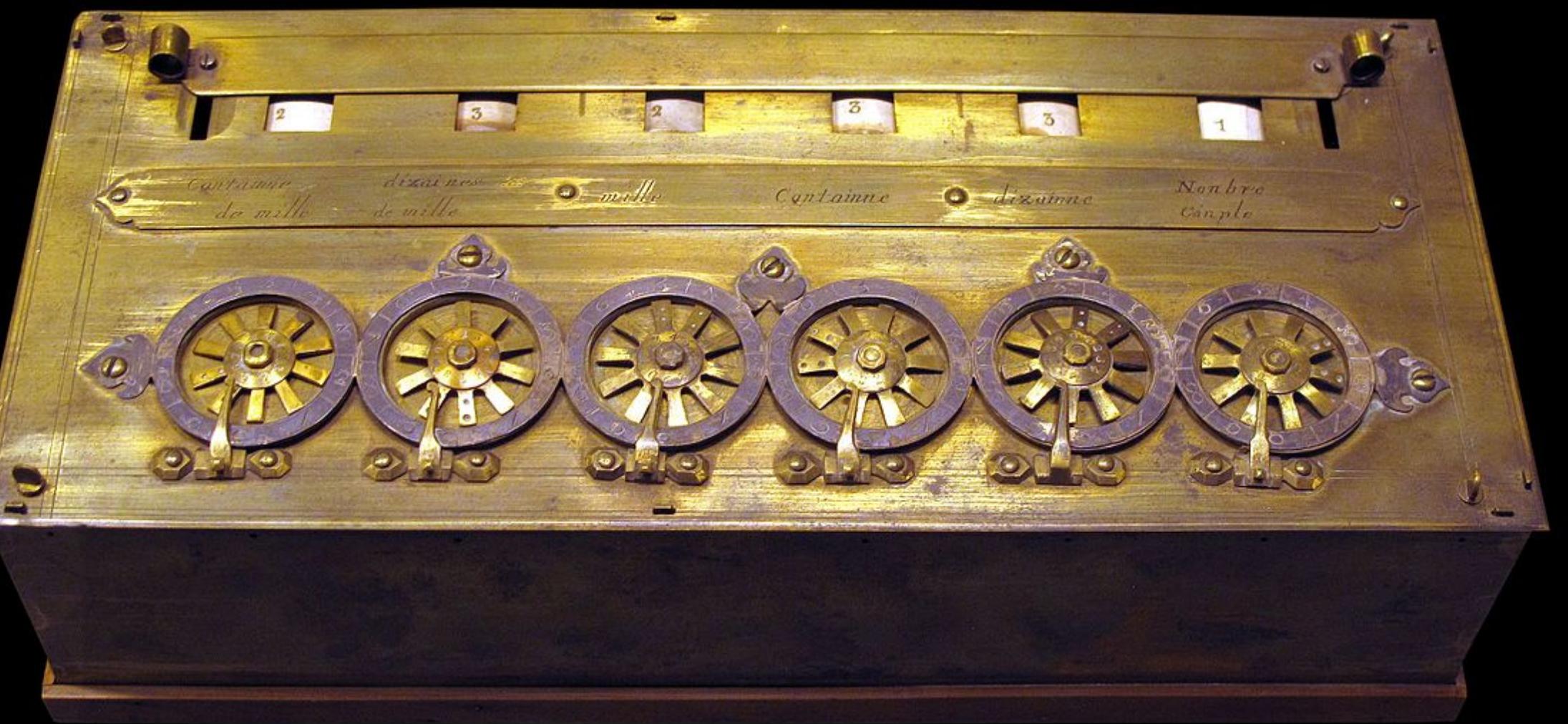


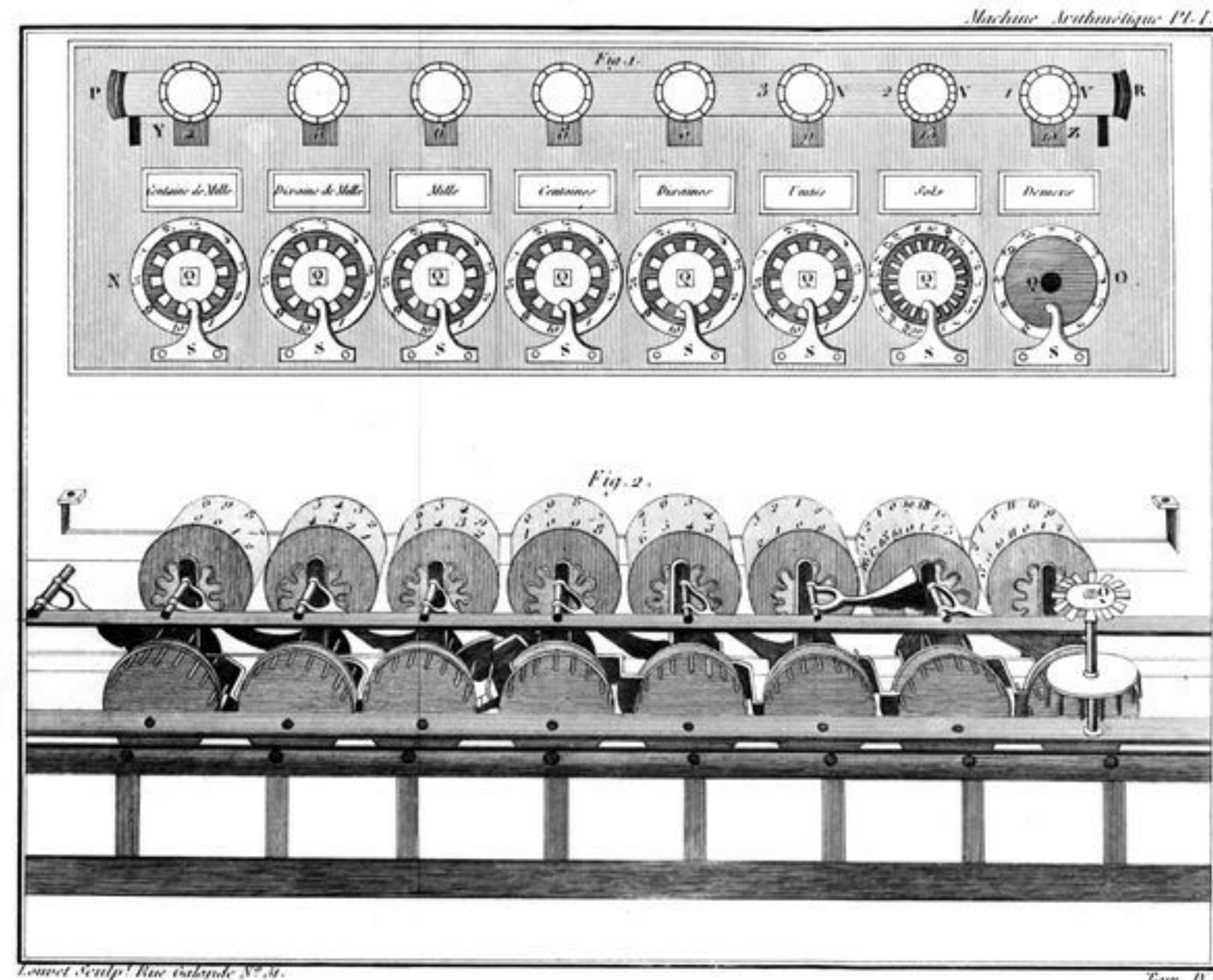
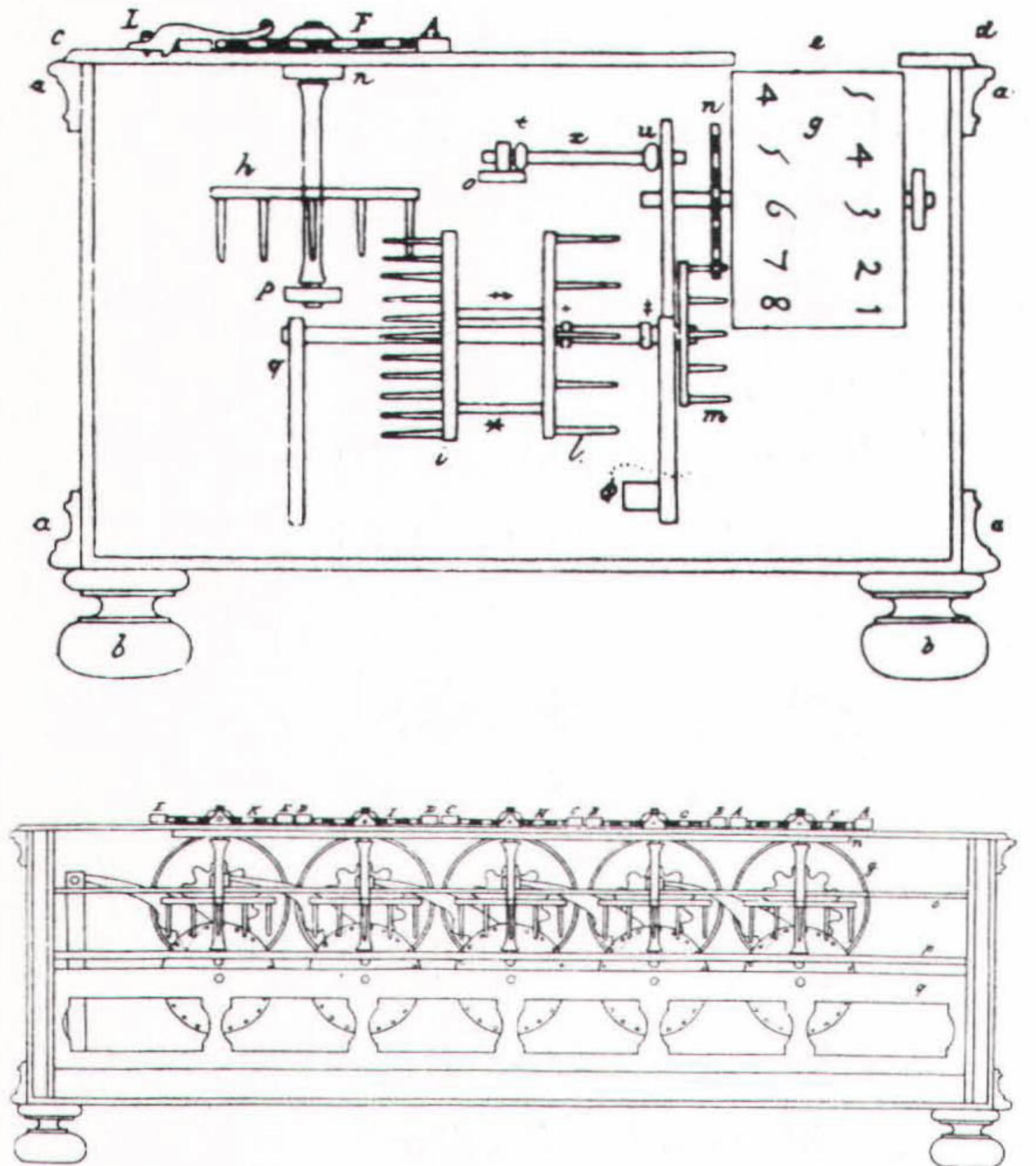
## **Blaise Pascal (1623-1662)**

Invented the Pascaline at the age of 19 for his father's tax calculations. Eight of the original machines have survived.



# Pascaline (1642-1645)





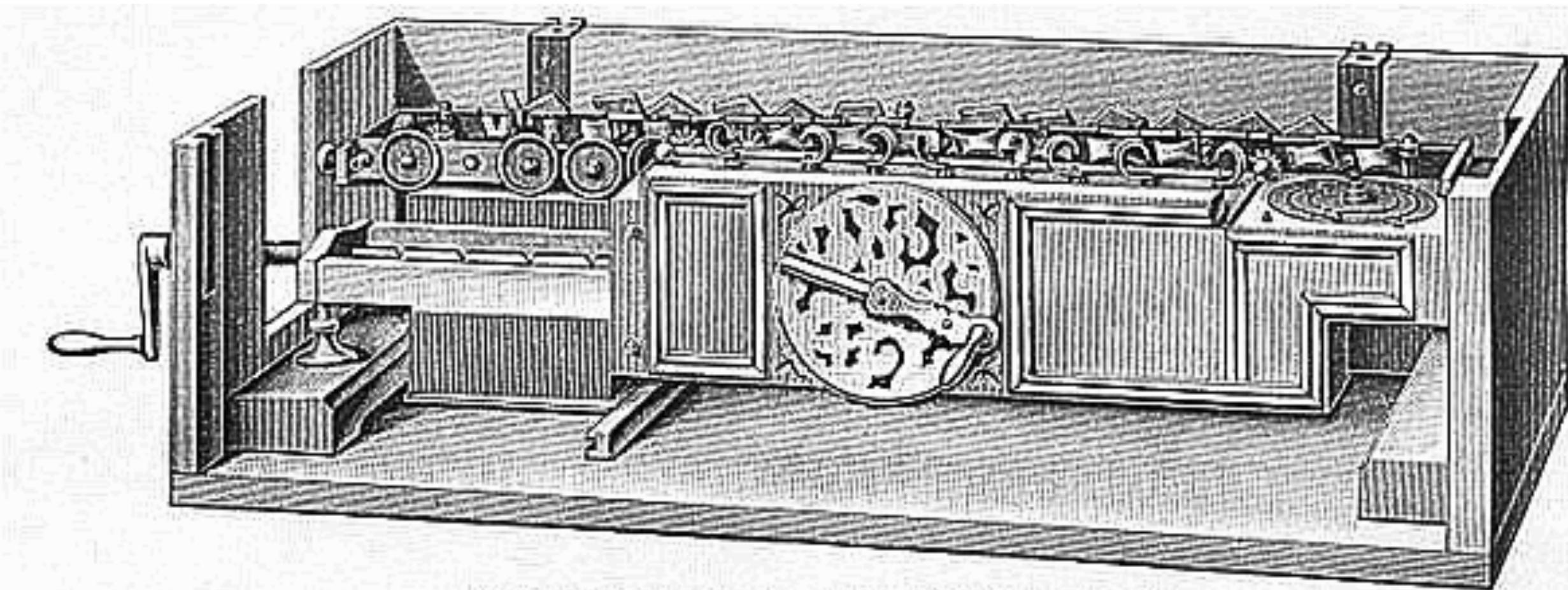
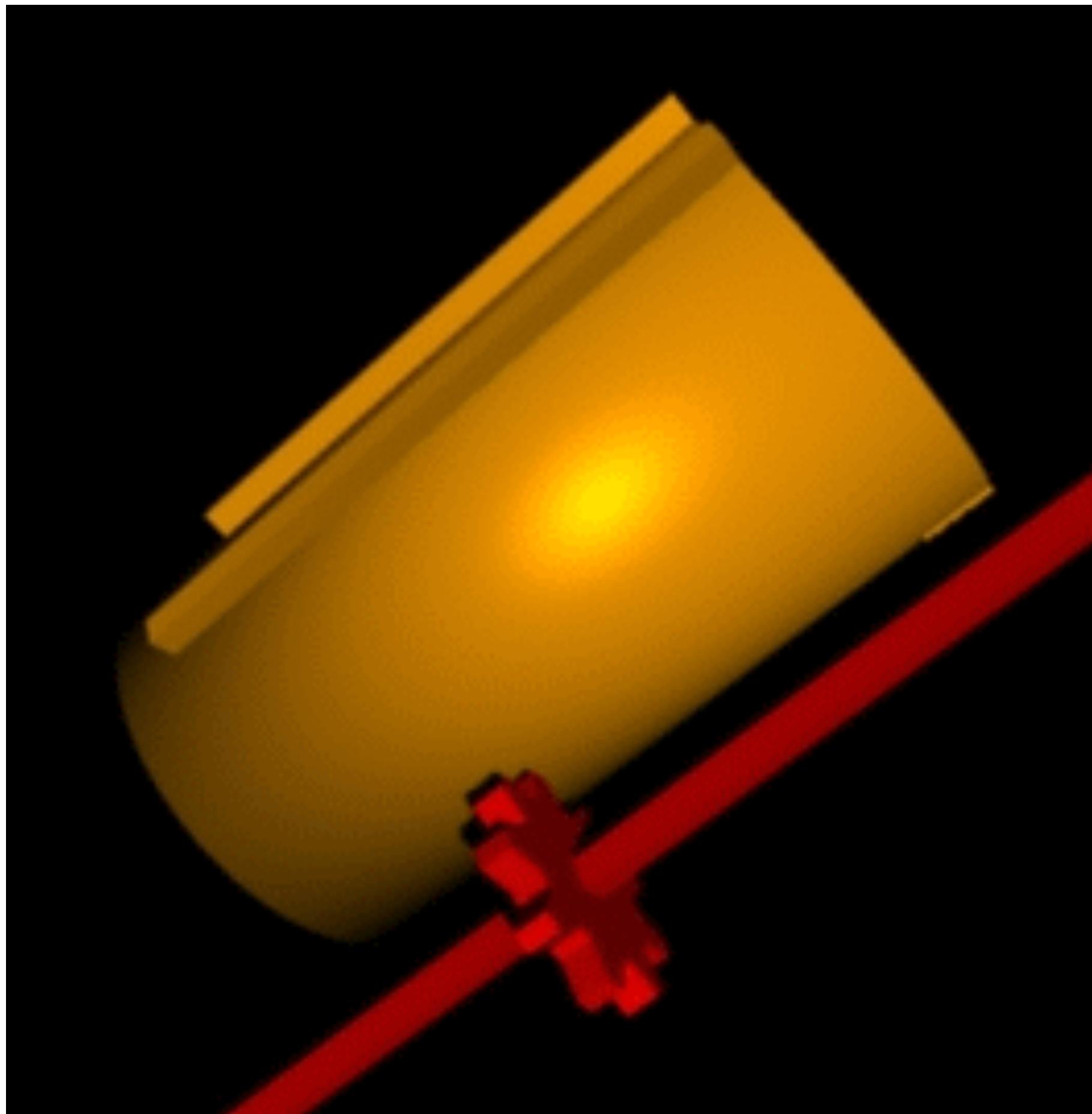


# Gottfried Wilhelm Leibniz (1646-1716)

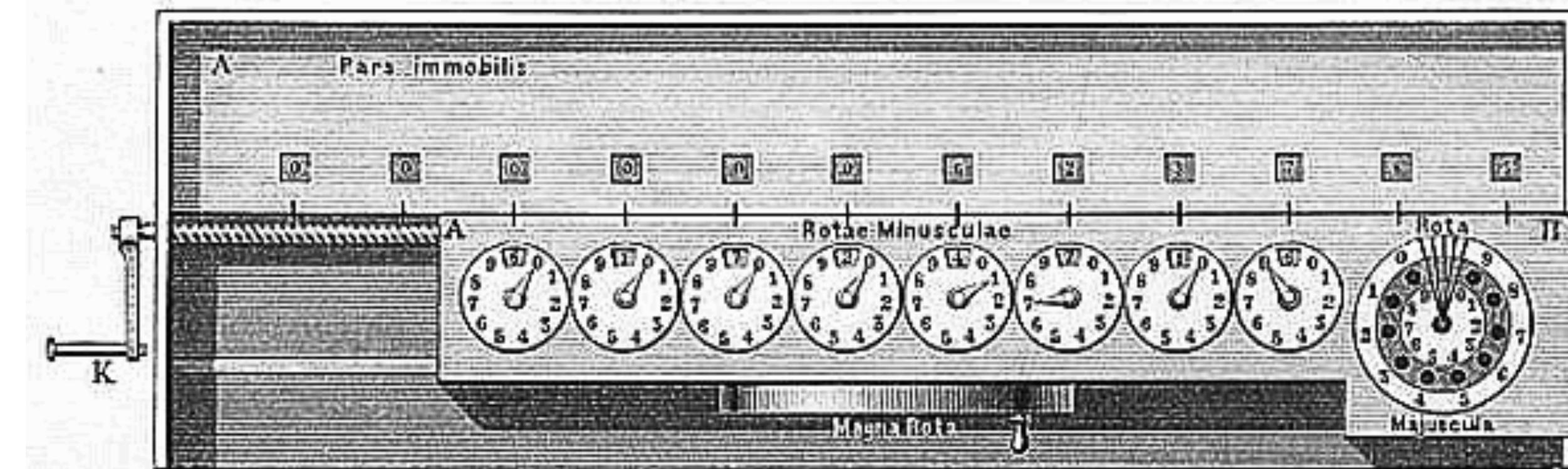


## Stepped reckoner (1673-1694)





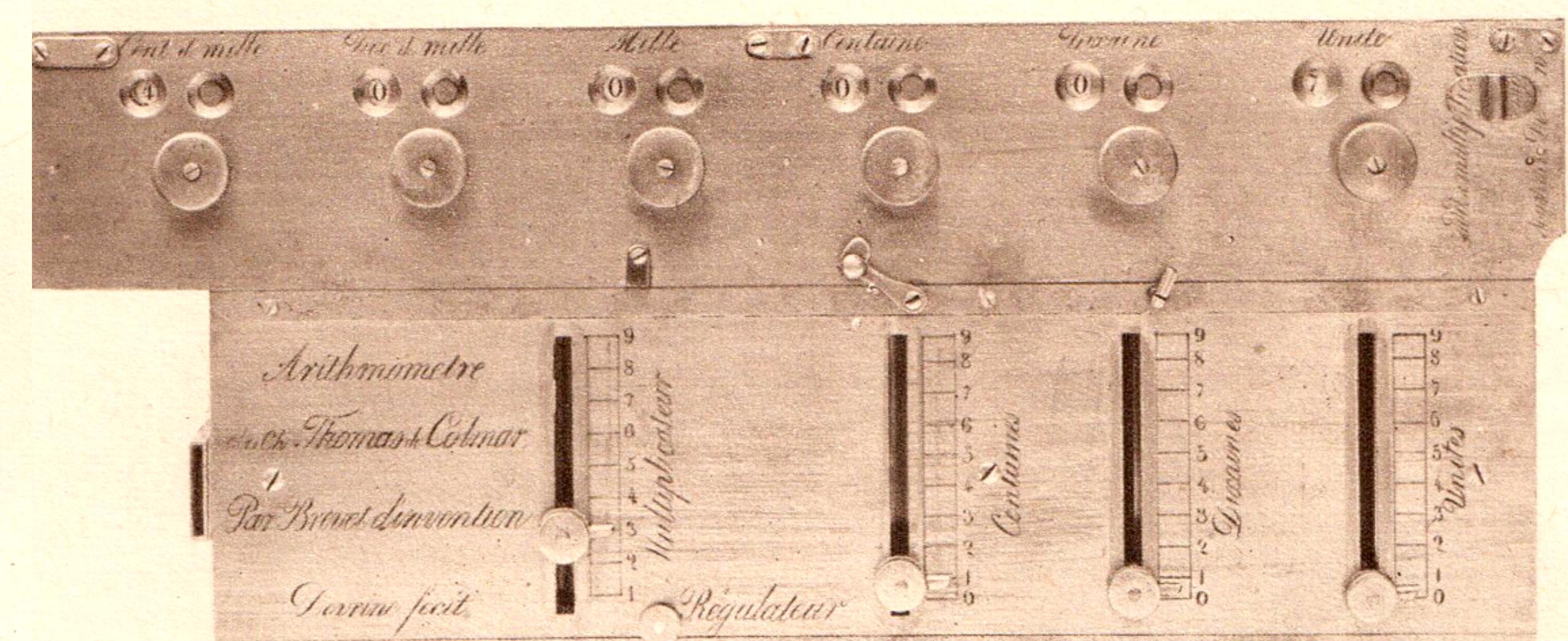
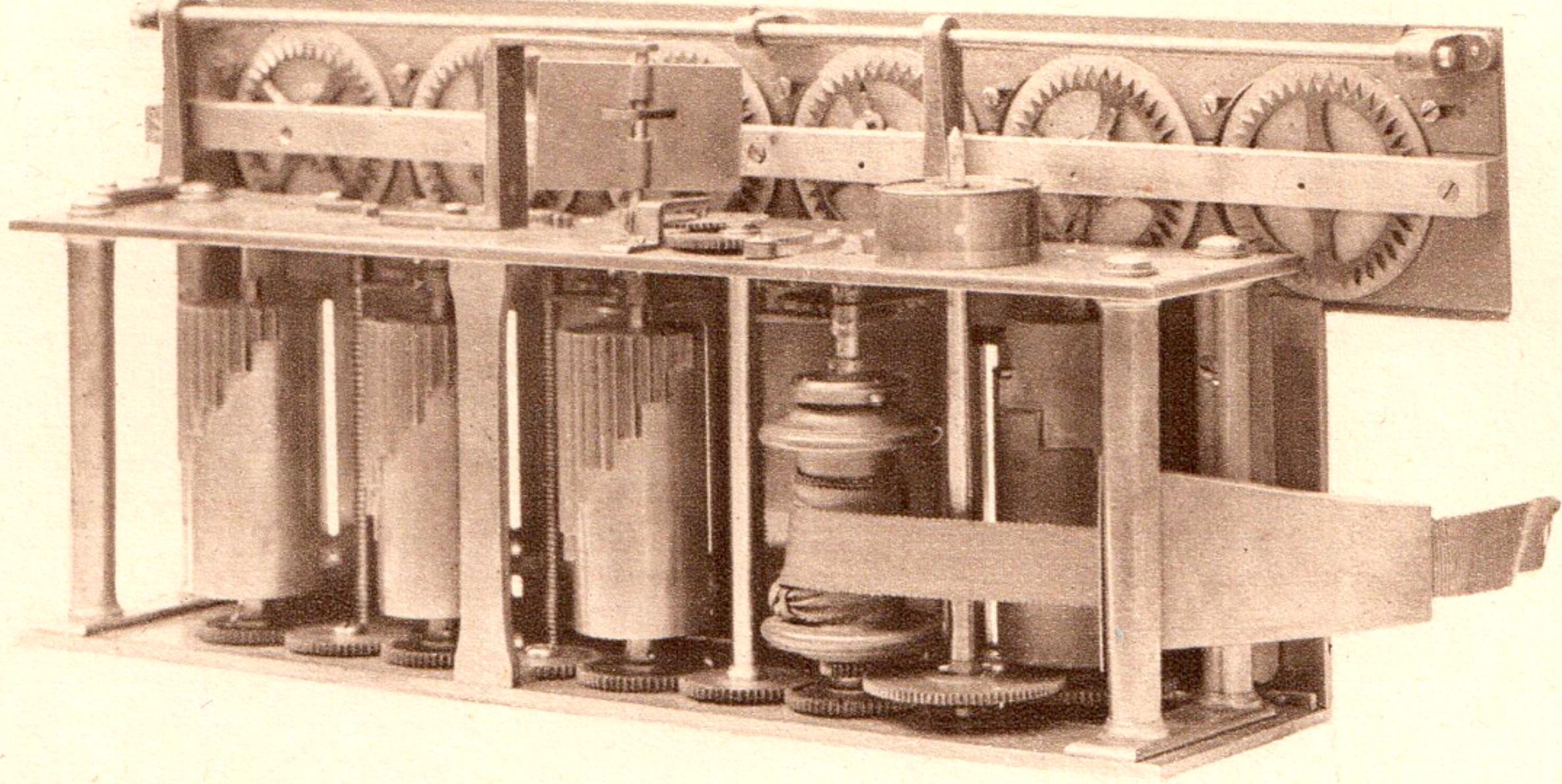
2. Rechenmaschine von Leibniz (1673, Hannover).



3. Leibnizsche Rechenmaschine, geometrische Zeichnung.

# Arithmometer (1820-1850)





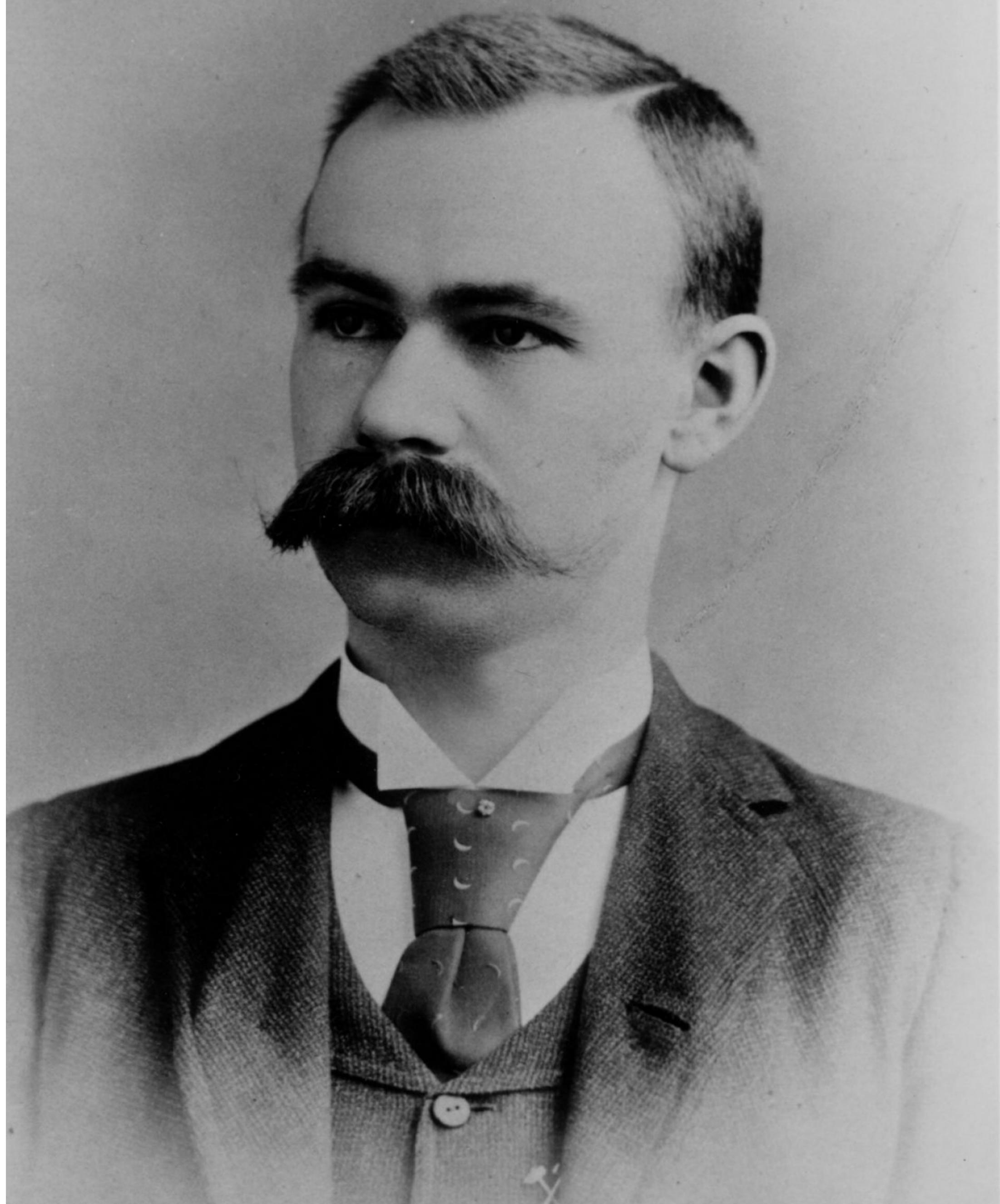


**www.arithmometre.org**  
**2012**

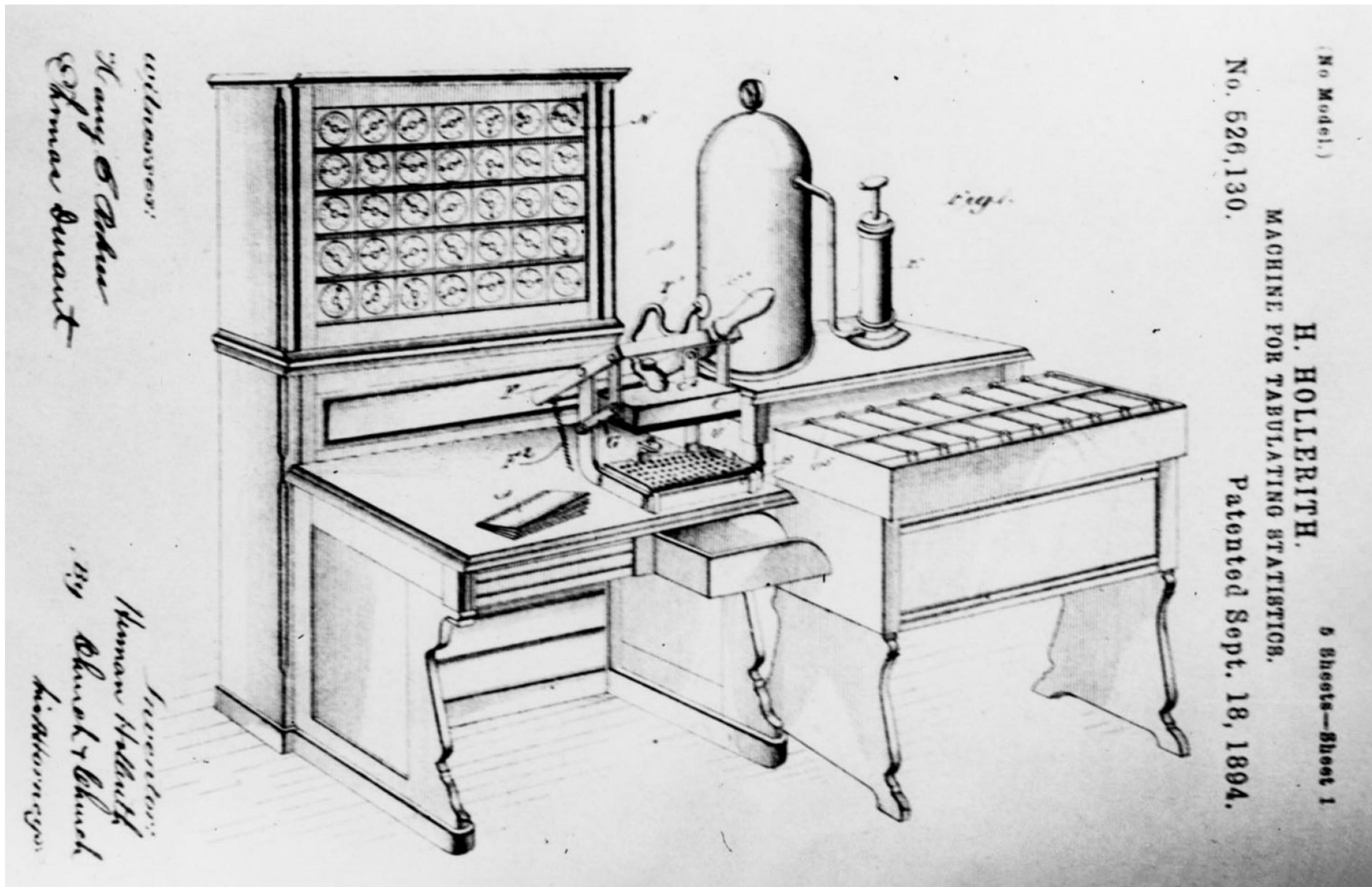
# Comptometer (1887)



# Herman Hollerith (1860-1929)



# Tabulating machine (1880s)



## Herman Hollerith (1860-1929)

The tabulating machine and the sorting machine were widely used in the 1890 US census. This electromechanical device uses punch cards for data storage and calculations.



# SCIENTIFIC AMERICAN

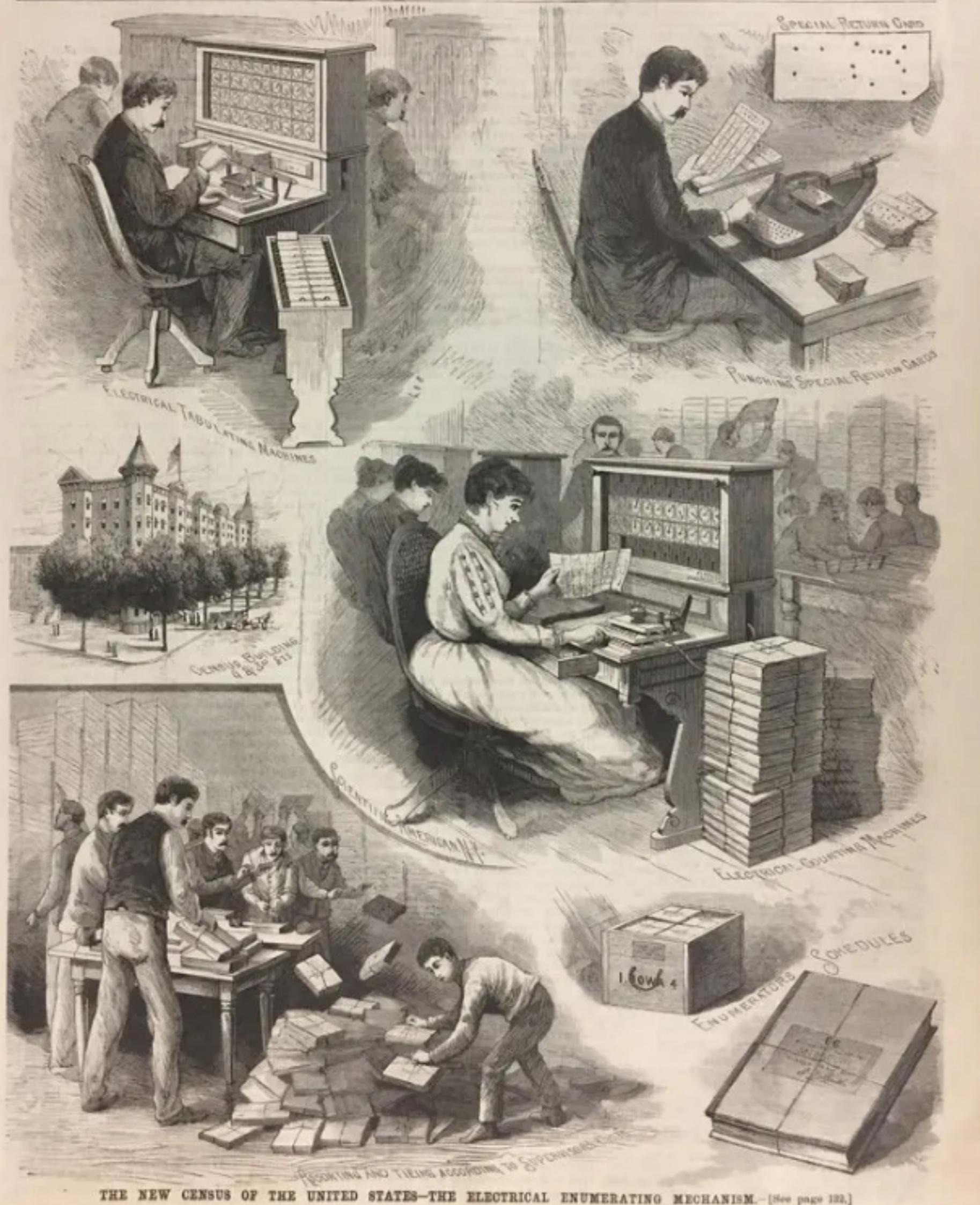
[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1890, by Munro & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

VOL. LXIII.—No. 9.  
ESTABLISHED 1845.

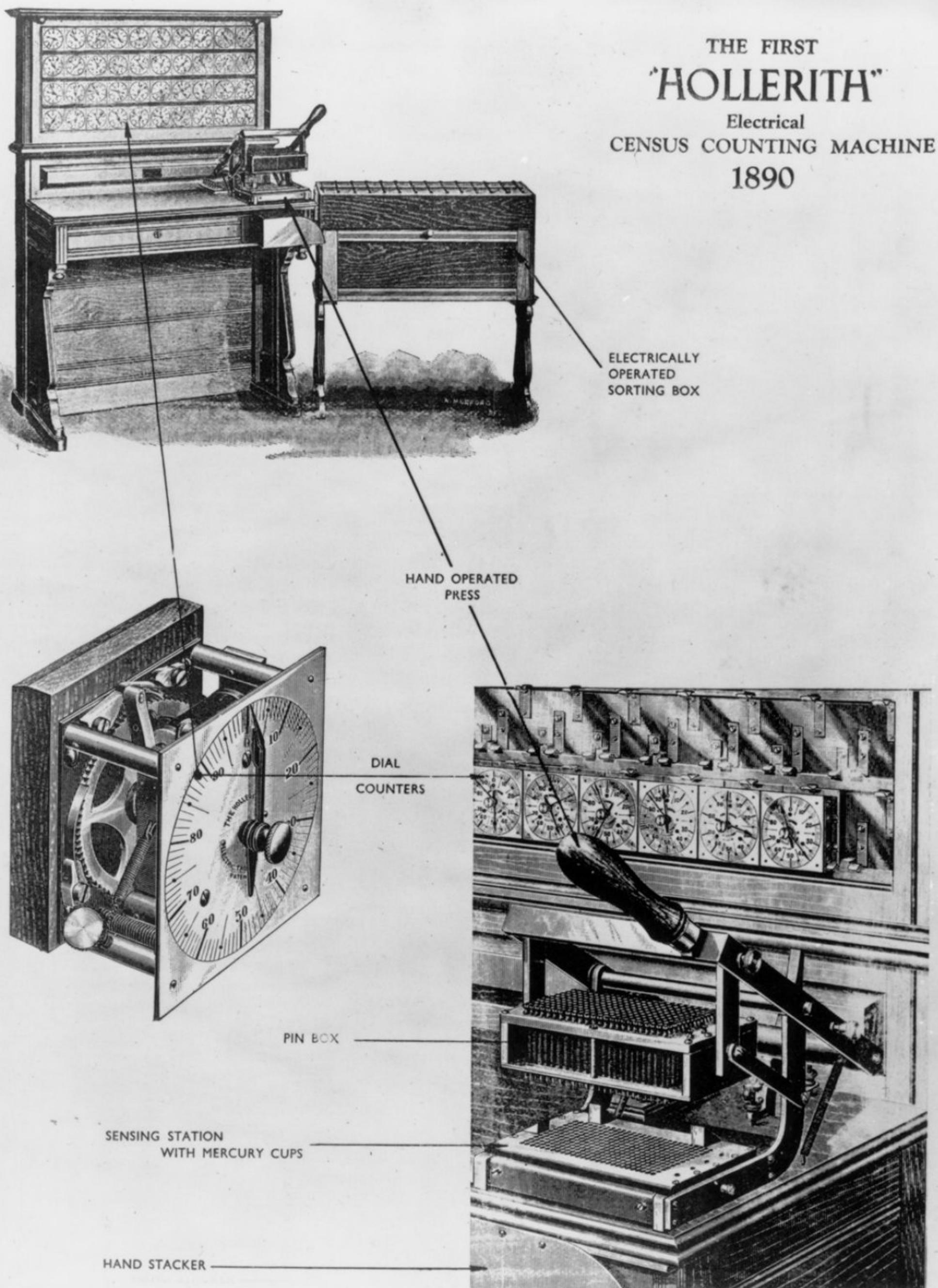
NEW YORK, AUGUST 30, 1890.

\$5.00 A YEAR.  
WEEKLY.



THE NEW CENSUS OF THE UNITED STATES—THE ELECTRICAL ENUMERATING MECHANISM.—[See page 122.]

THE FIRST  
**'HOLLERITH'**  
Electrical  
CENSUS COUNTING MACHINE  
1890



## FAMILY SCHEDULE—I TO 10 PERSONS.

Supervisor's District No. \_\_\_\_\_  
Enumeration District No. \_\_\_\_\_

[7-556 b.]

Eleventh Census of the United States.

SCHEDULE No. 1.

POPULATION AND SOCIAL STATISTICS.

Name of city, town, township, \_\_\_\_\_; County: \_\_\_\_\_; State: \_\_\_\_\_  
precinct, district, beat, or other minor civil division.

Street and No.: \_\_\_\_\_; Ward: \_\_\_\_\_; Name of Institution: \_\_\_\_\_

1890

Enumerated by me on the \_\_\_\_\_ day of June, 1890.

TISTRG

Enumerator.

A.—Number of Dwelling-house in the order of visitation.	B.—Number of families in this dwelling-house.	C.—Number of persons in this dwelling-house.	D.—Number of Family in the order of visitation.	E.—No. of Persons in this family.
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	1	2	3	4	5
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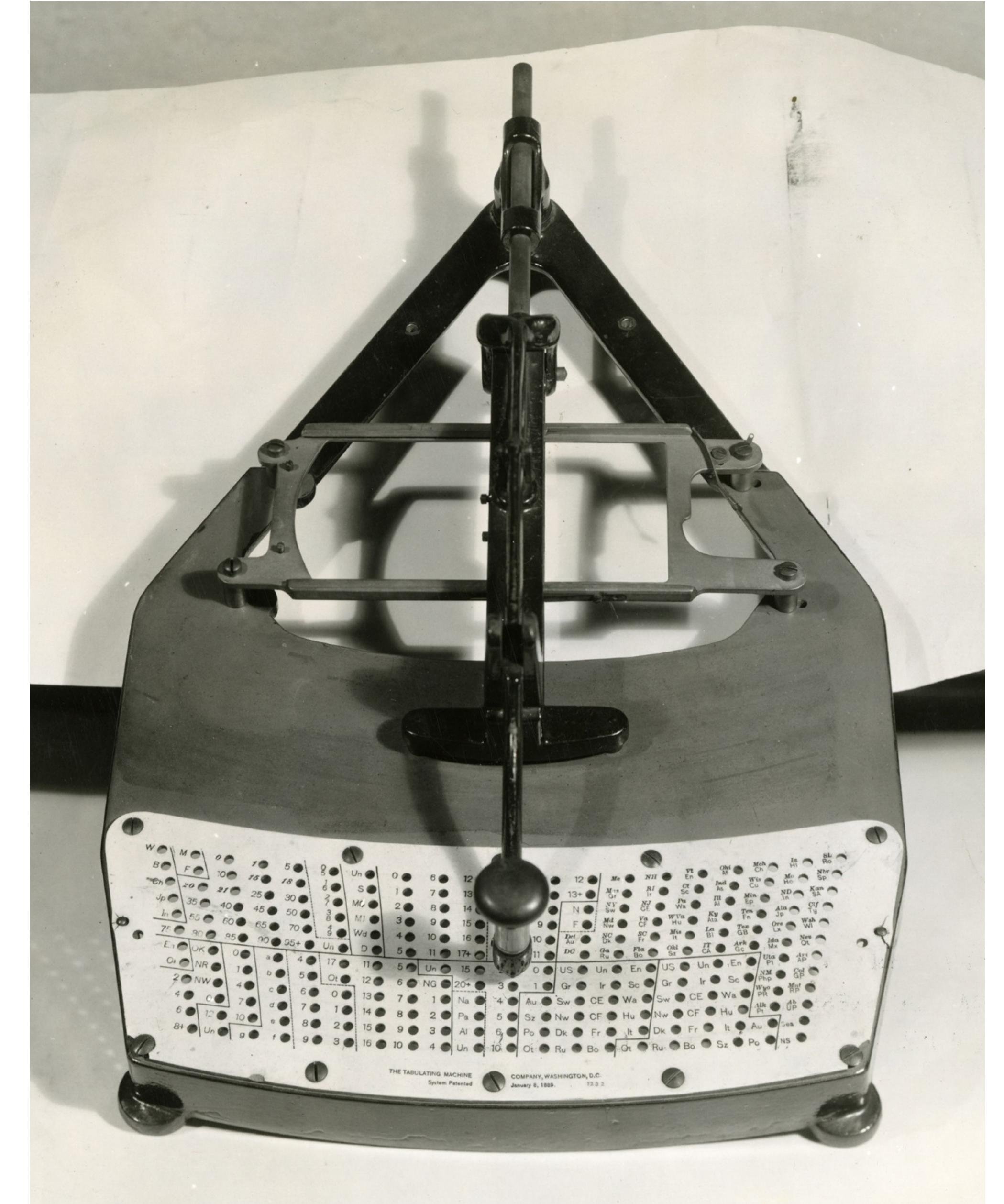
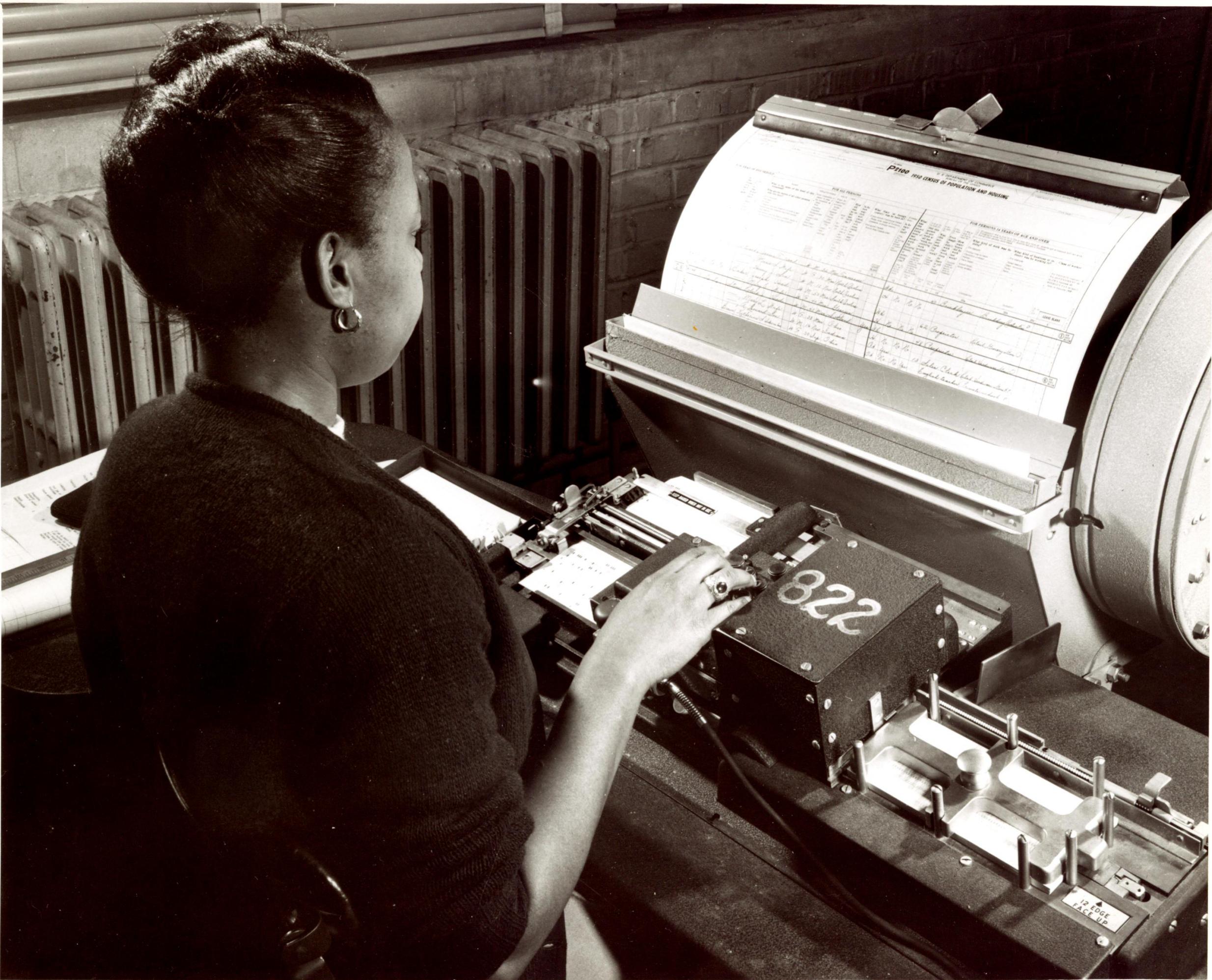
1 Christian name in full, and initial of middle name.					
2 Surname.					
3 Whether a soldier, sailor, or marine during the civil war (U. S. or Conf.), or widow of such person.					
4 Relationship to head of family.					
5 Whether white, black, mulatto, quadroon, octroon, Chinese, Japanese, or Indian.					
6 Sex.					
7 Age at nearest birthday. If under one year, give age in months.					
8 Whether single, married, widowed, or divorced.					
9 Whether married during the census year (June 1, 1889, to May 31, 1890).					
10 Mother of how many children, and number of these children living.					
11 Place of birth.					
12 Place of birth of Father.					
13 Place of birth of Mother.					
14 Number of years in the United States.					
15 Whether naturalized.					
16 Whether naturalization papers have been taken out.					
17 Profession, trade, or occupation.					
18 Months unemployed during the census year (June 1, 1889, to May 31, 1890).					
19 Attendance at school (in months) during the census year (June 1, 1889, to May 31, 1890).					
20 Able to Read.					
21 Able to Write.					
22 Able to speak English. If not, the language or dialect spoken.					
23 Whether suffering from acute or chronic disease, with name of disease and length of time affected.					
24 Whether deaf, dumb, blind, sight, hearing, or speech, or whether crippled, maimed, or deformed, with name of defect.					
25 Whether a prisoner, convict, homeless child, or pauper.					

TO ENUMERATORS.—See inquiries numbered 26 to 30, inclusive, on the second page of this schedule. These inquiries must be made concerning each family and each farm visited.

(1929-1,780,000.) 1b 34

Reprinted, 1935

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5	6	7	8	No	Hd	Wf	W	F	5	35	65	1	3	Sg	5	10	5	10	D	H	O	d	k	
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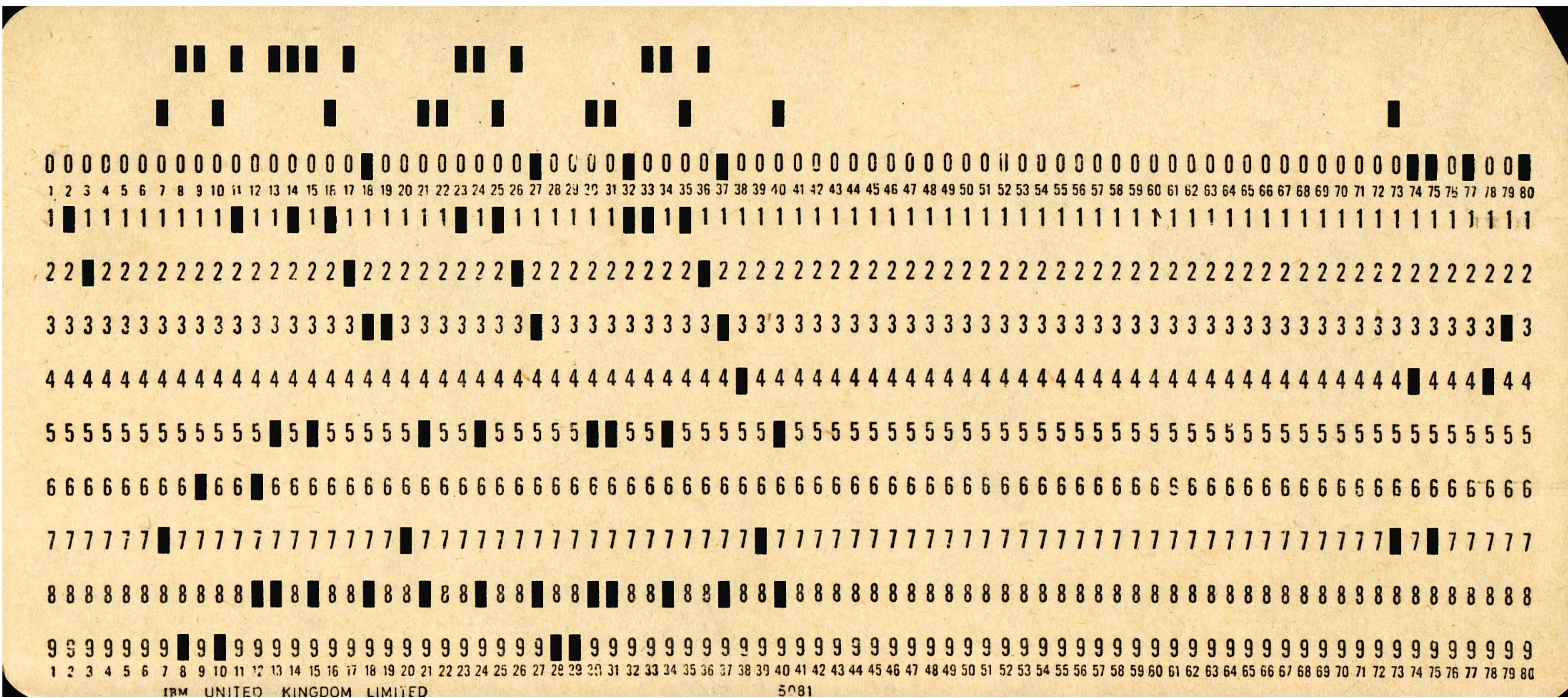




Amir Zare

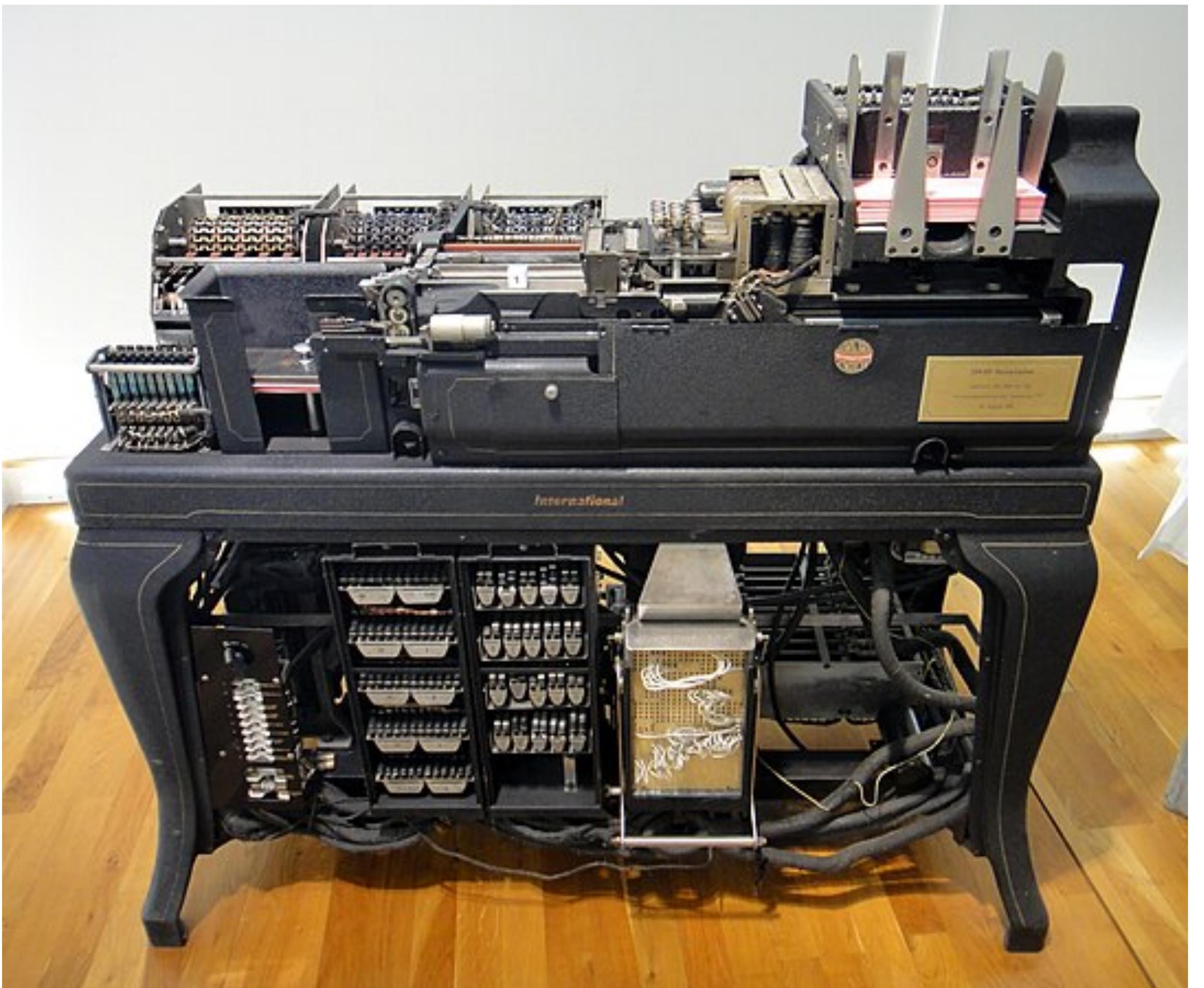
AI

History of AI



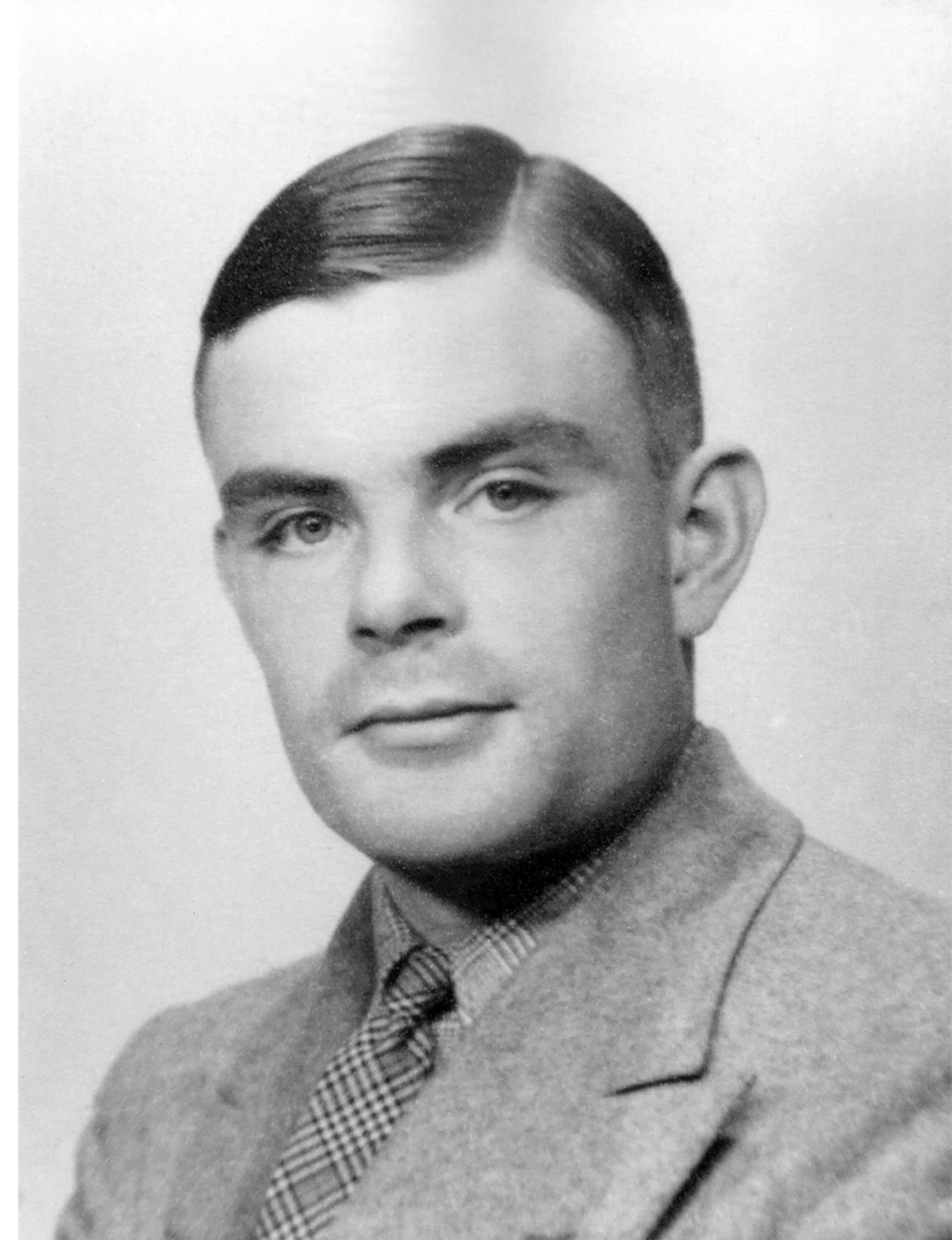
# IBM 601 (1931)

First IBM machine to do multiplication. Could read two numbers from a punch card and punch the result onto the same card.



## **Alan Mathison Turing (1912-1954)**

Published the idea of Turing machine in 1936



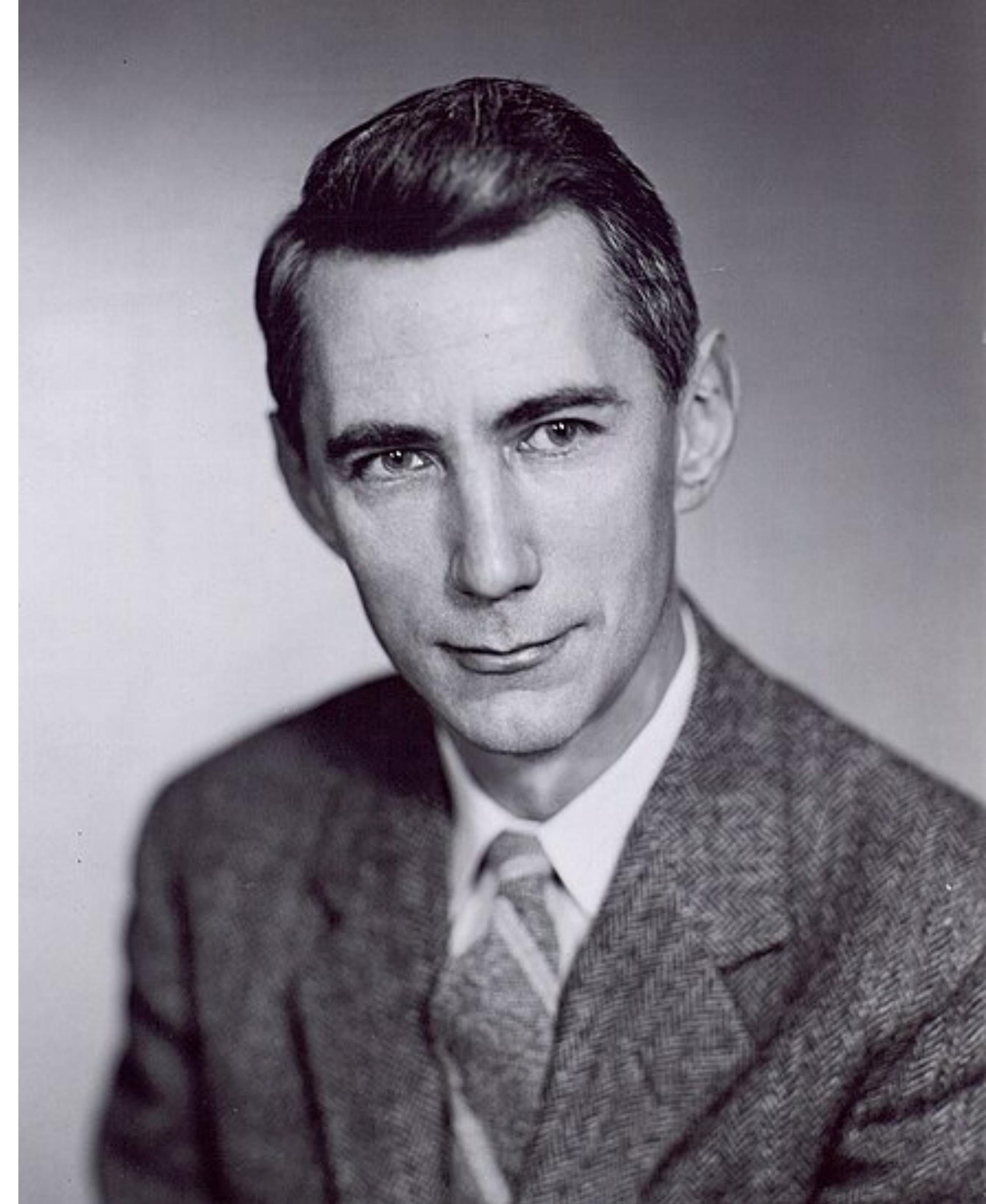
## **George Robert Stibitz (1904-1995)**

Constructed a 1-bit binary adder using relays in  
1937



## **Claude Elwood Shannon (1916-2001)**

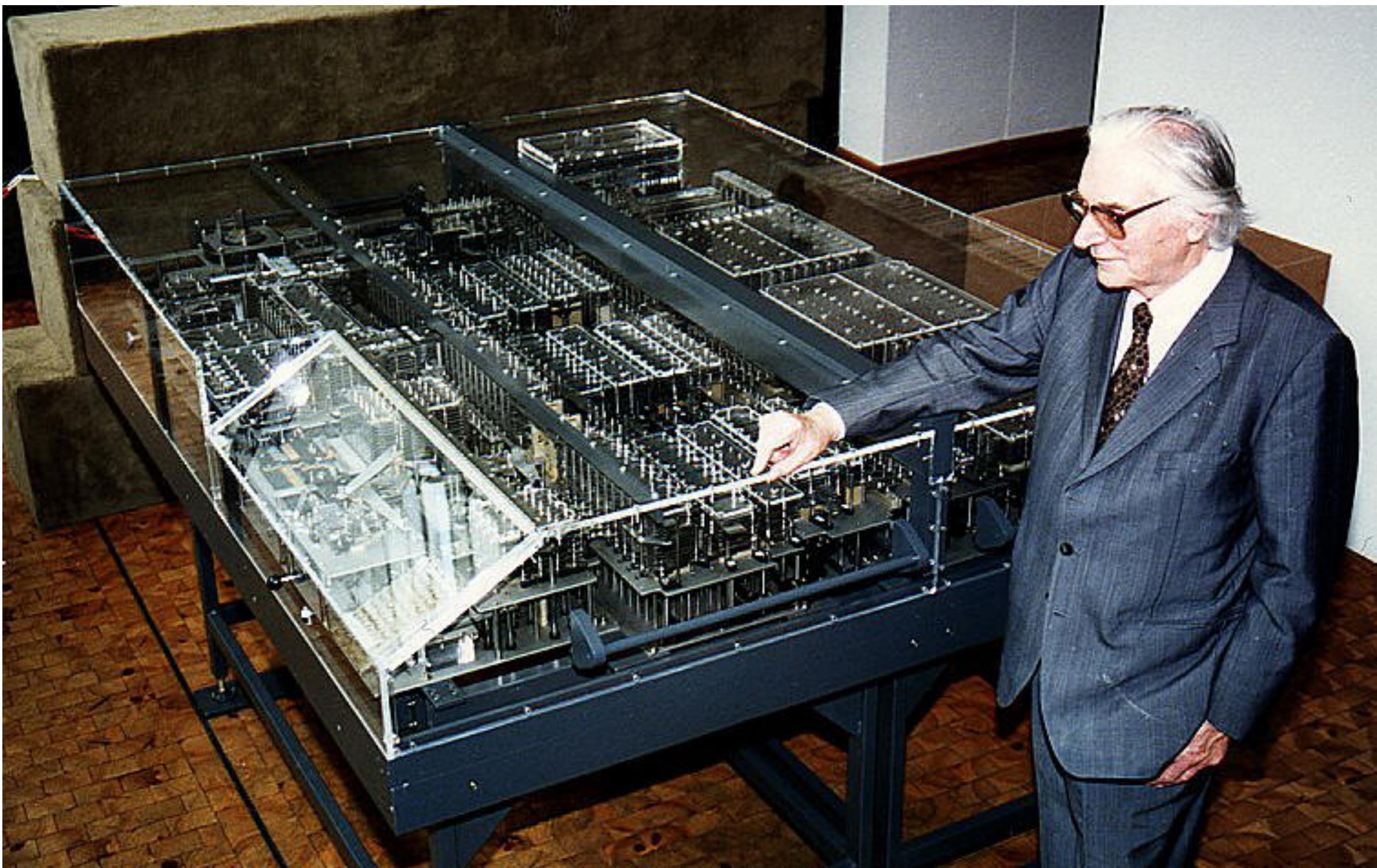
Published a paper on the implementation of symbolic logic using relays as his MIT Master's thesis in 1937.



## Konrad Ernst Otto Zuse (1910-1995)

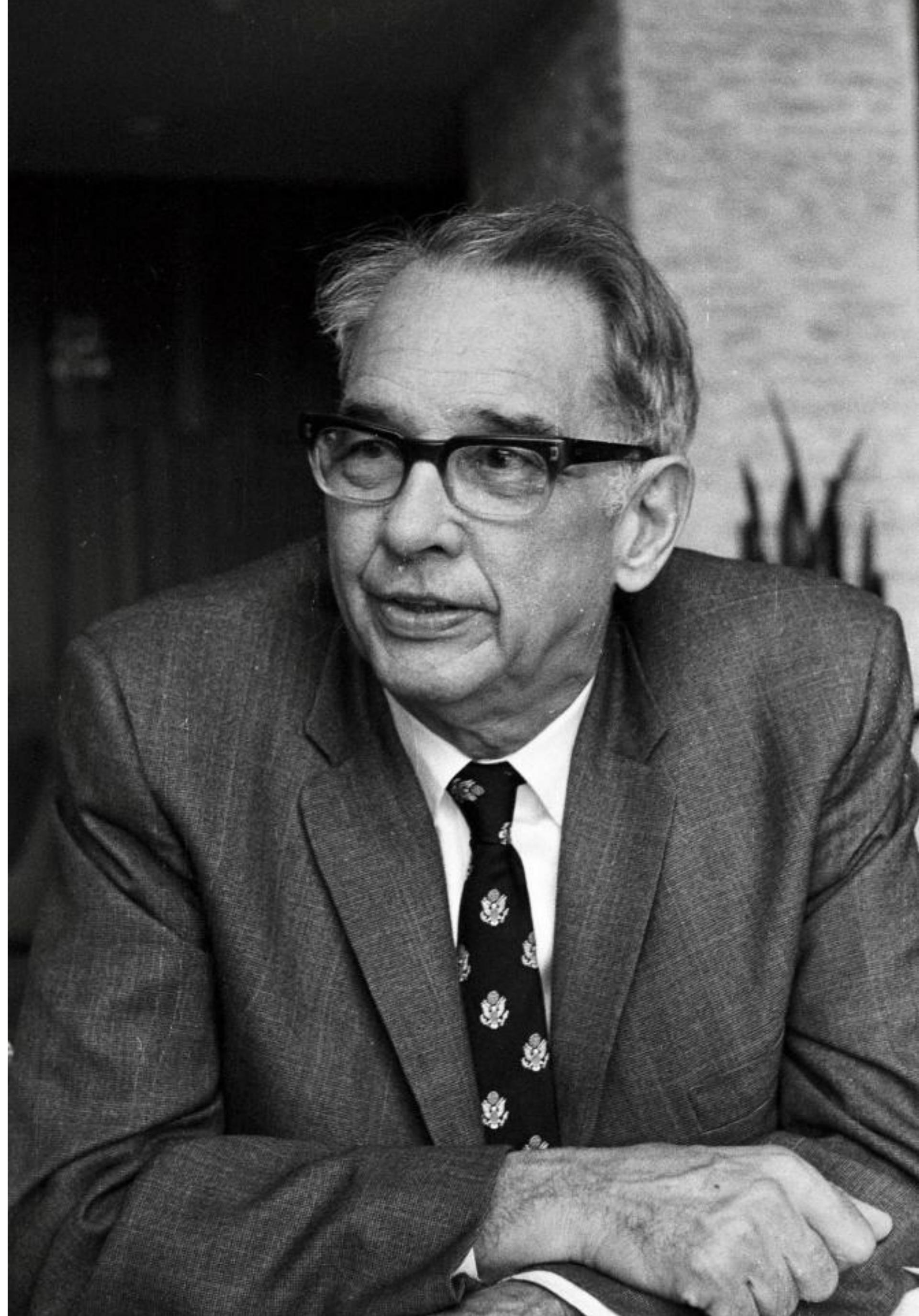
Built the Z1 in 1938. It was the first mechanical binary programmable computer. The original machine and its blueprints were lost in bombing of Berlin in World War II.

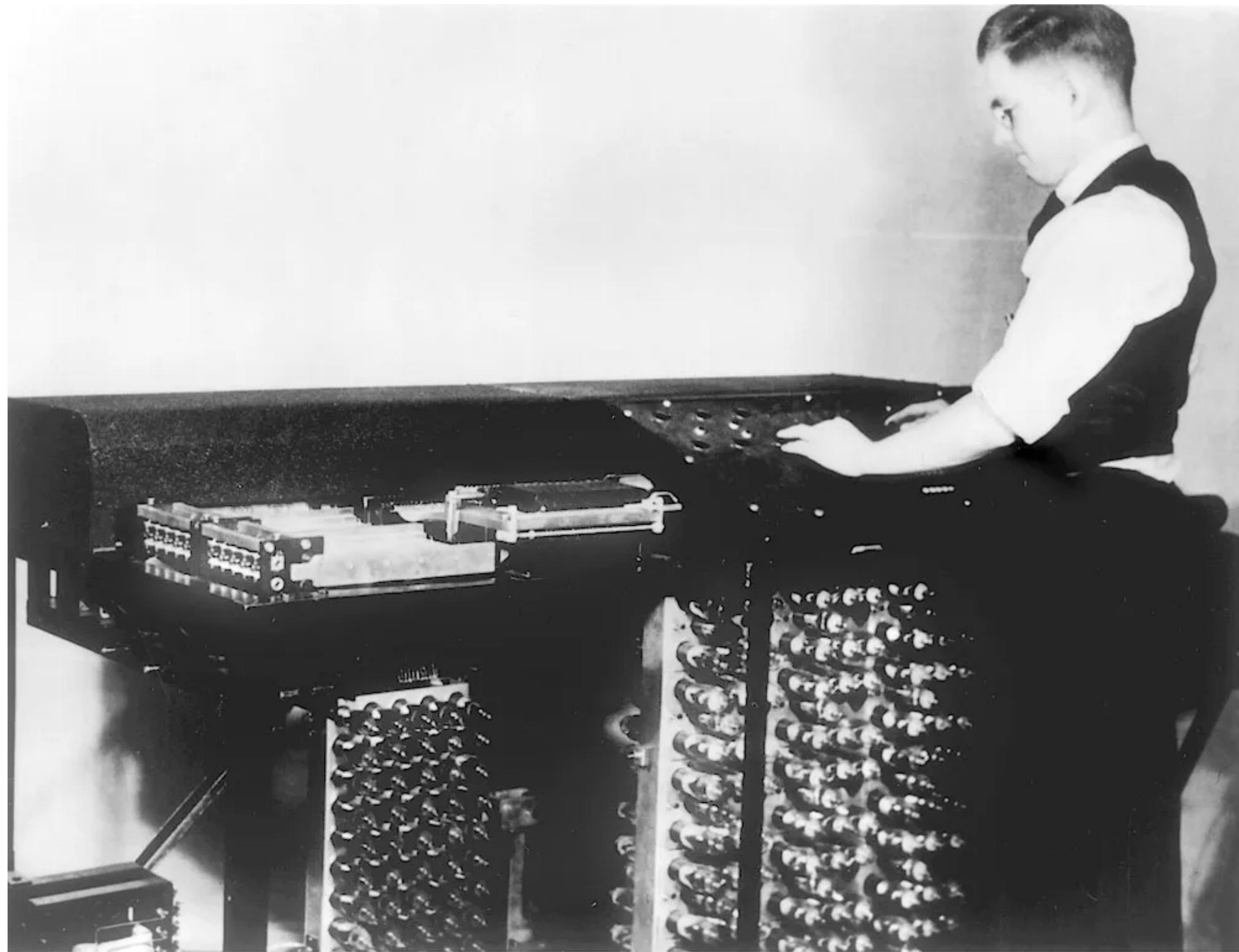


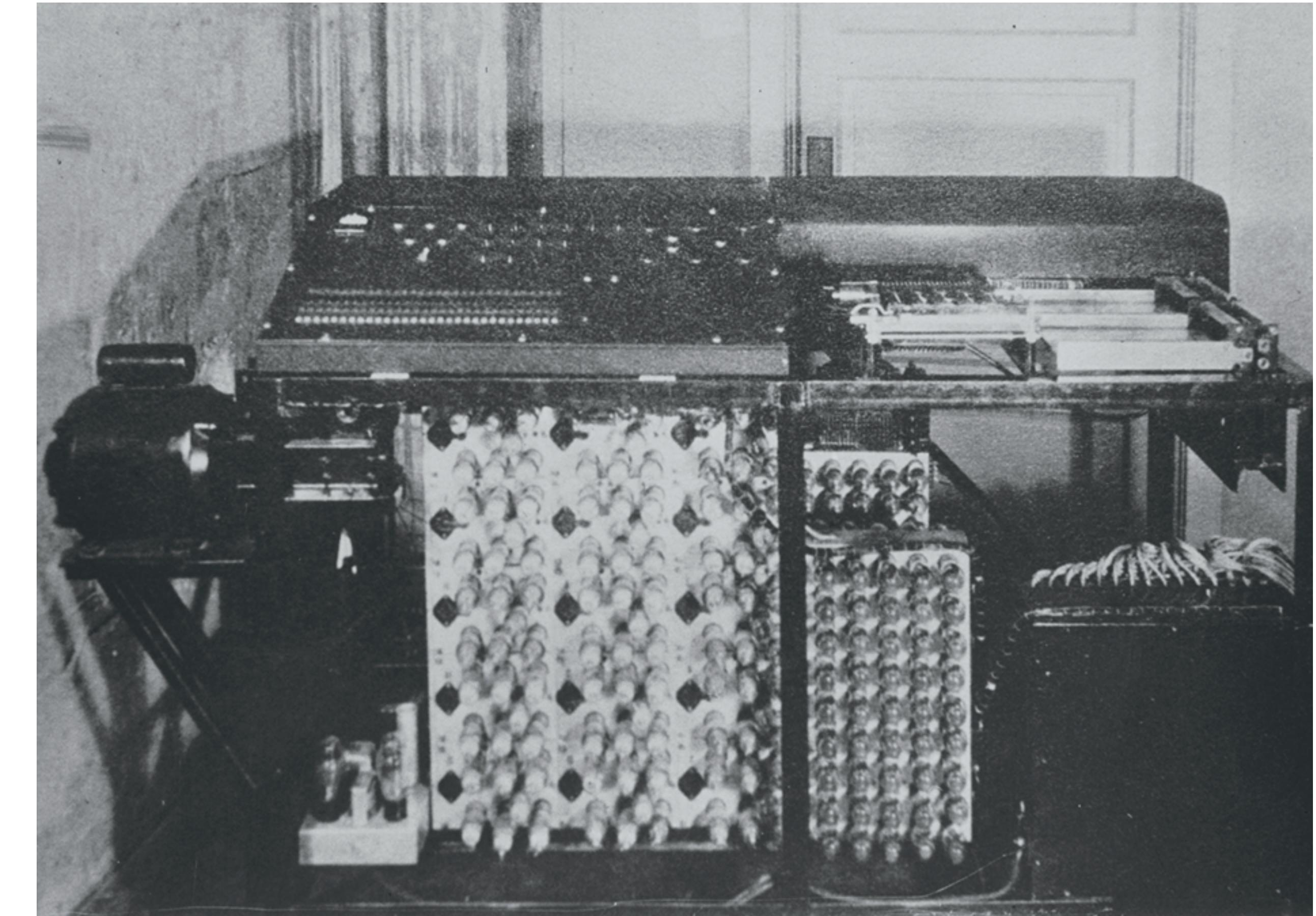
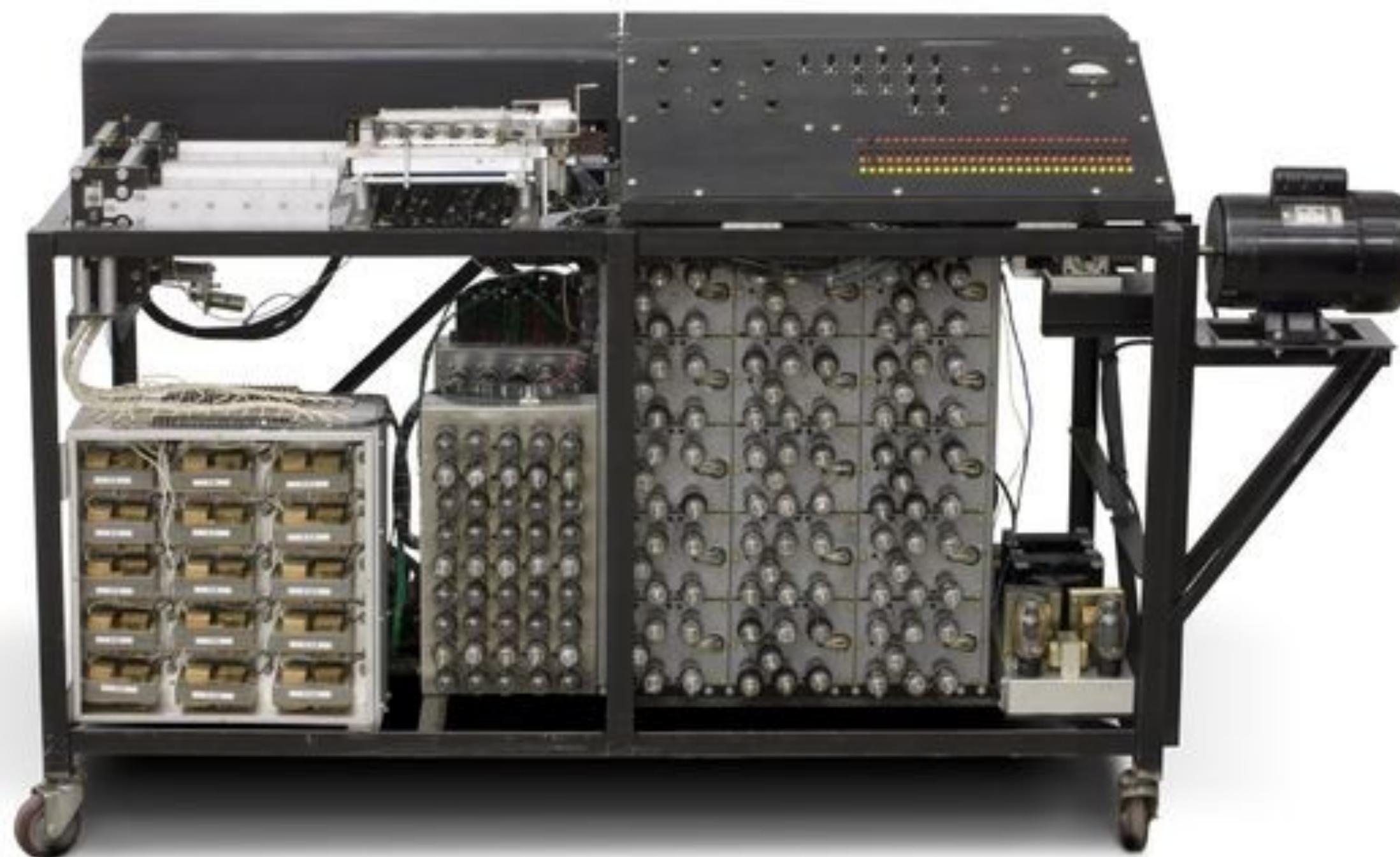


## **John Vincent Atanasoff (1903-1995)**

With graduate student Clifford Berry built a 16-bit adder. This was the first machine to calculate using vacuum tubes. They went on to build the Atanasoff-Berry Computer (ABC) in 1942; a special-purpose calculator for solving systems of simultaneous linear equations,





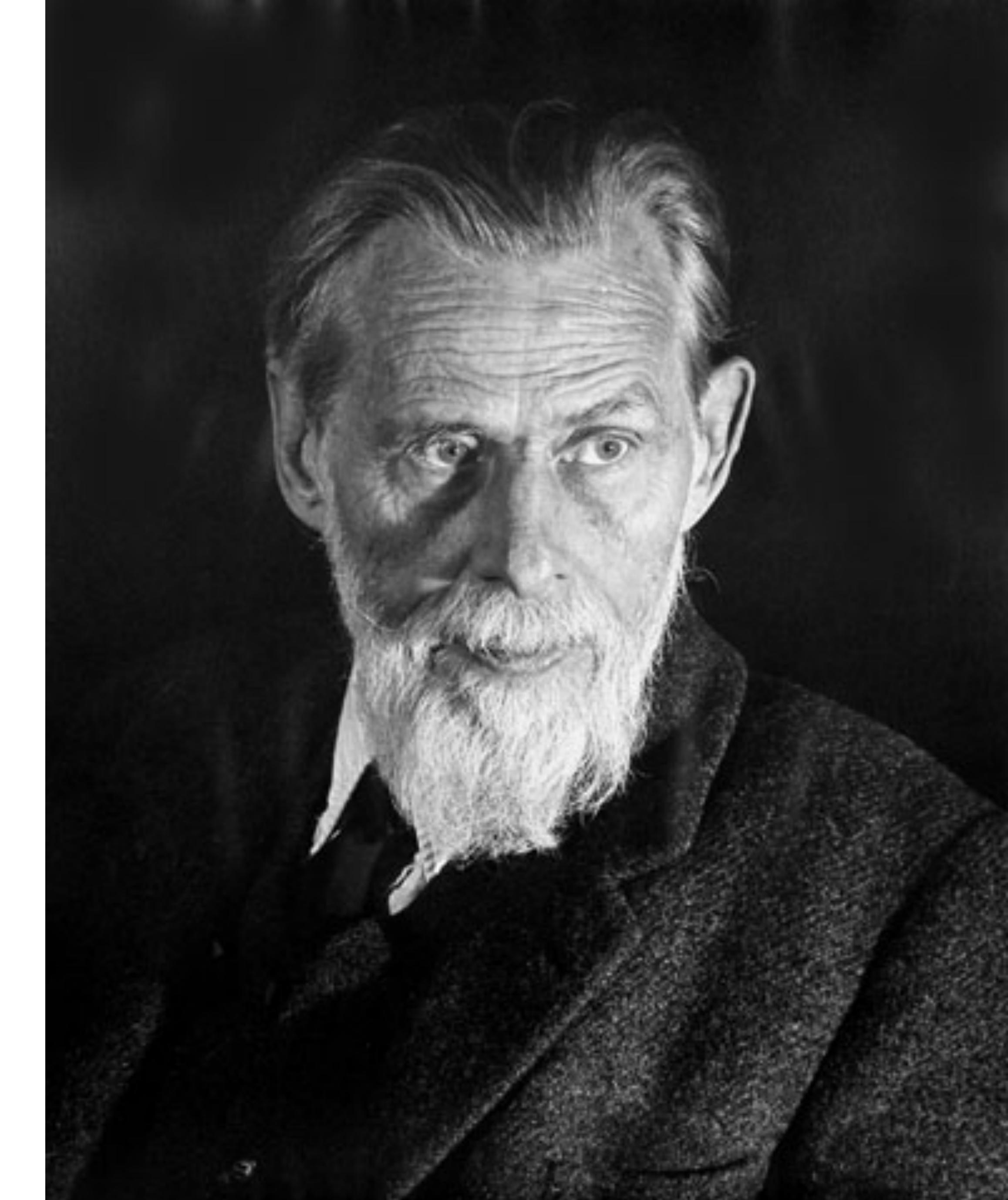




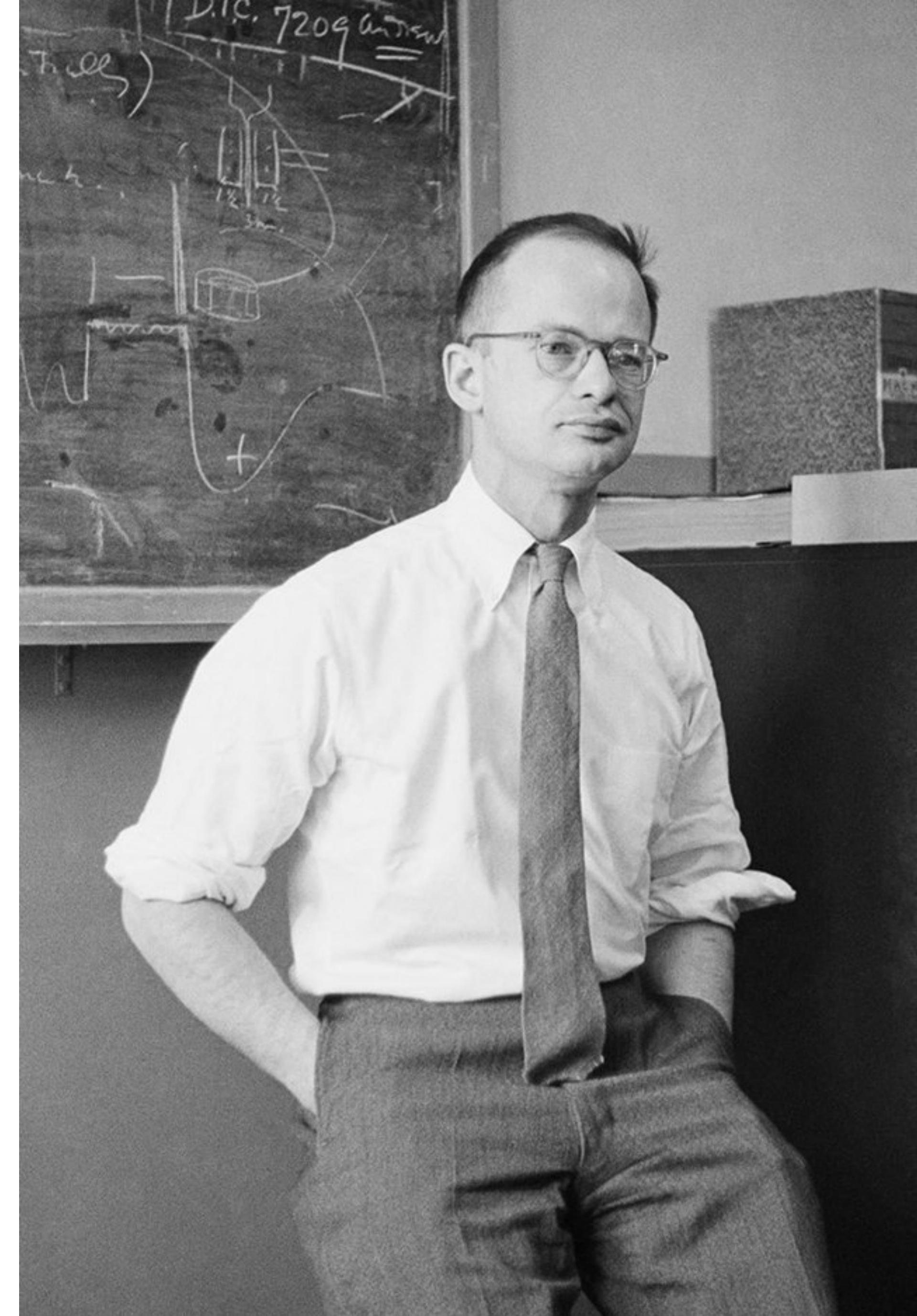
# Scene 3: AI

# **1943-1956: Foundational Ideas**

## **Warren Sturgis McCulloch (1898-1969)**

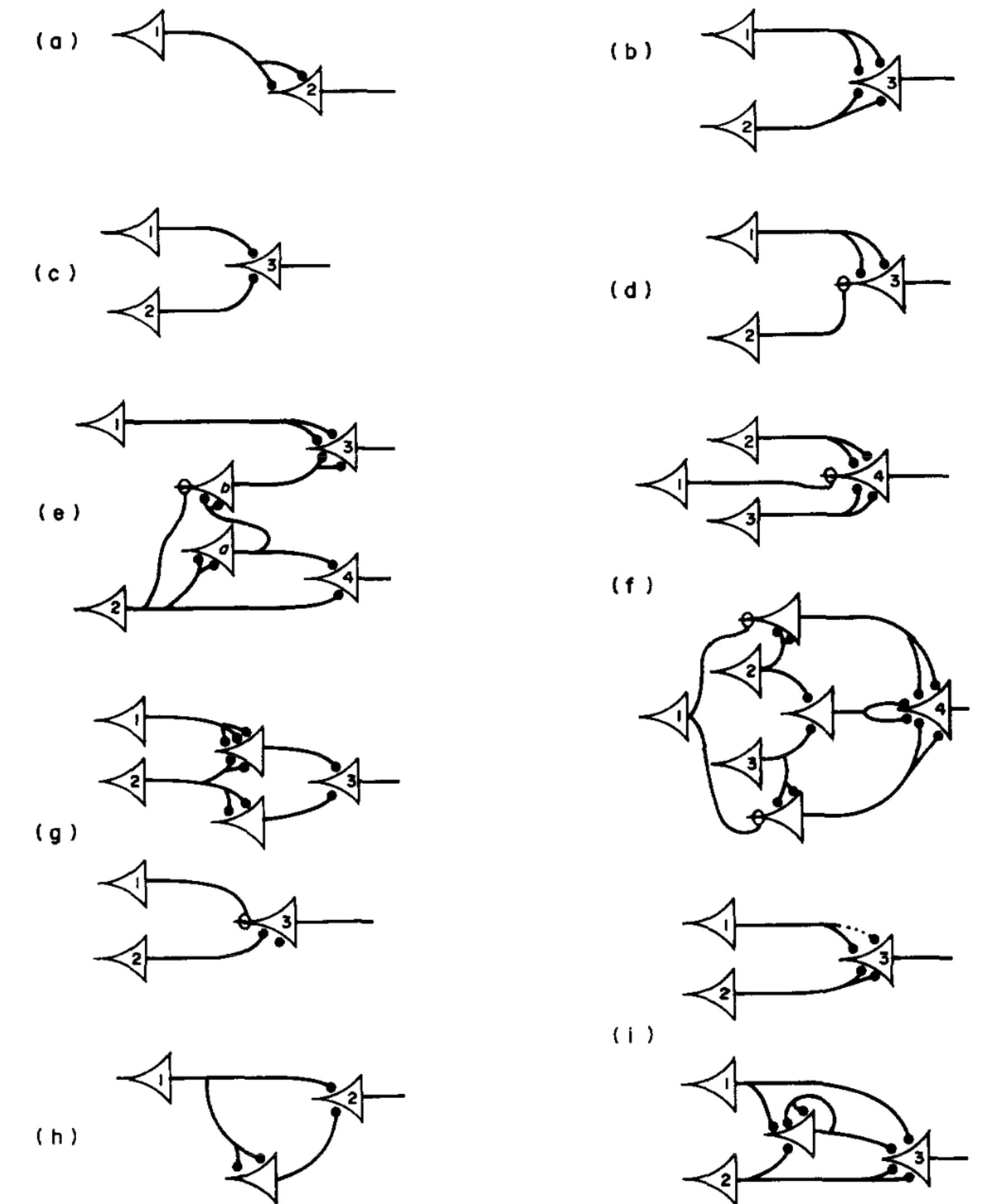


# Walter Harry Pitts, Jr. (1923-1969)

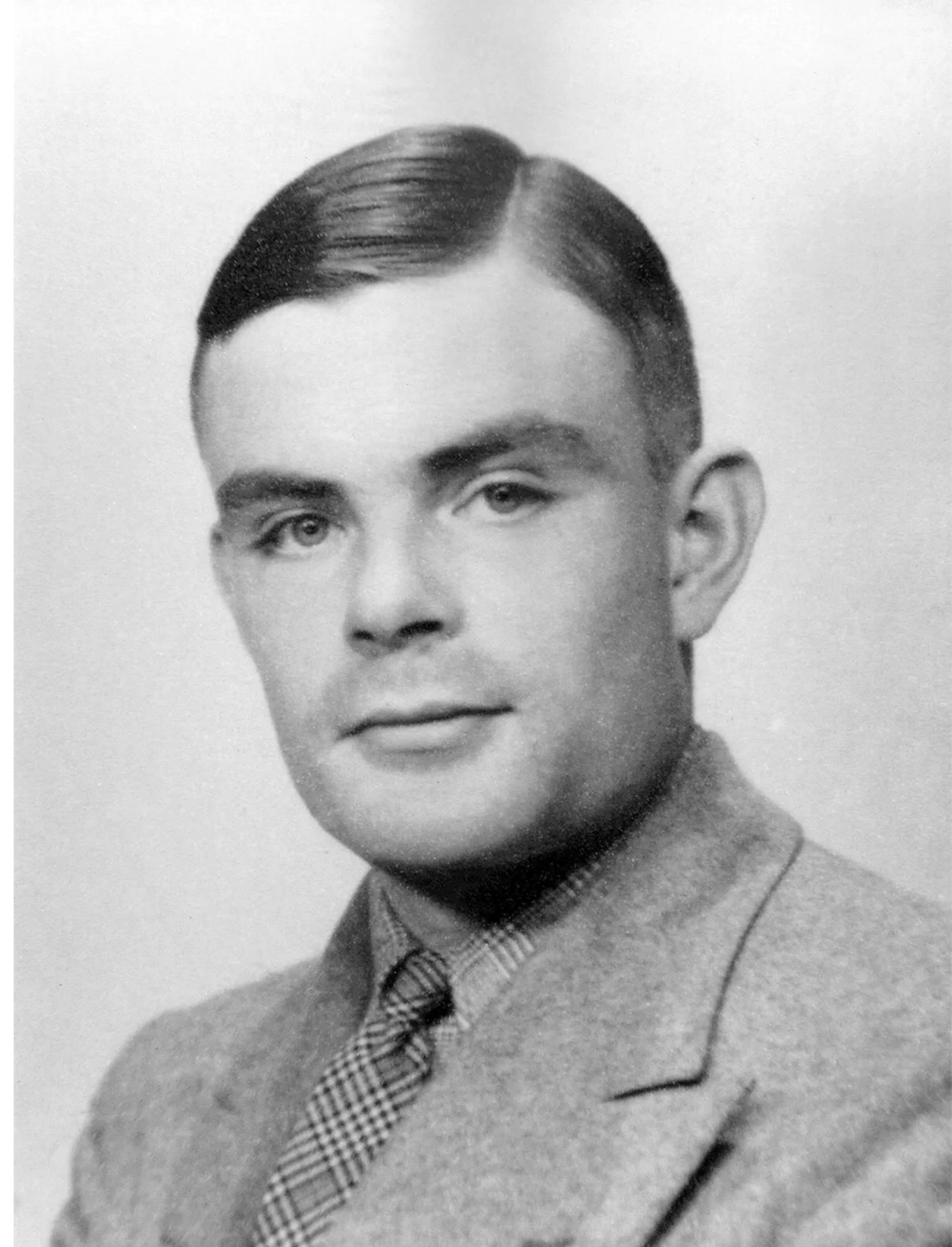


## A Logical Calculus of the Ideas Immanent in Nervous Activity 1943

The first mathematical model of a neuron and a network of neurons.



# **Alan Mathison Turing (1912-1954)**



# Alan Mathison Turing (1912-1954)

Turing published the idea of the imitation game (Turing test) in 1950 in COMPUTING MACHINERY AND INTELLIGENCE

MSS. and other Communications for the Editor should be addressed to  
Prof. G. RYLE, Magdalen College, Oxford.

VOL. LIX. No. 236.

OCTOBER, 1950

## MIND

A QUARTERLY REVIEW  
OF  
PSYCHOLOGY AND PHILOSOPHY

EDITED BY  
PROF. GILBERT RYLE  
WITH THE CO-OPERATION OF PROF. SIR F. C. BARTLETT AND PROF. C. D. BROAD

### CONTENTS.

	PAGE
I.—Computing Machinery and Intelligence: A. M. TURING	433
II.—Subject and Predicate: P. T. GEACH	461
III.—Frege's <i>Sinn und Bedeutung</i> : P. D. WIENPAHL	483
IV.—The Theory of Sovereignty Restated: W. J. REES	495
V.—A Note on Verification: F. C. COPLESTON	522
Notes	529
VI.—Discussions:	
Ostensive Definition and Empirical Certainty:	
A. PAP	530
Pragmatic Paradoxes: P. ALEXANDER	536
The Causal Theory of Perception: J. WATLING	539
"Fallacies in Moral Philosophy." A Reply to Mr. Baier: S. HAMPSHIRE	541
The Existence of God: T. MCPHERSON	545
Berkeley's <i>Philosophical Commentaries</i> : A. A. LUCE	551
A Note on Aristotle. Categories 6a 15: M. WARNOCK	552
VII.—Critical Notice:	
<i>Moral Obligation</i> : Essays and Lectures by H. A. PRICHARD	555
VIII.—New Books	567

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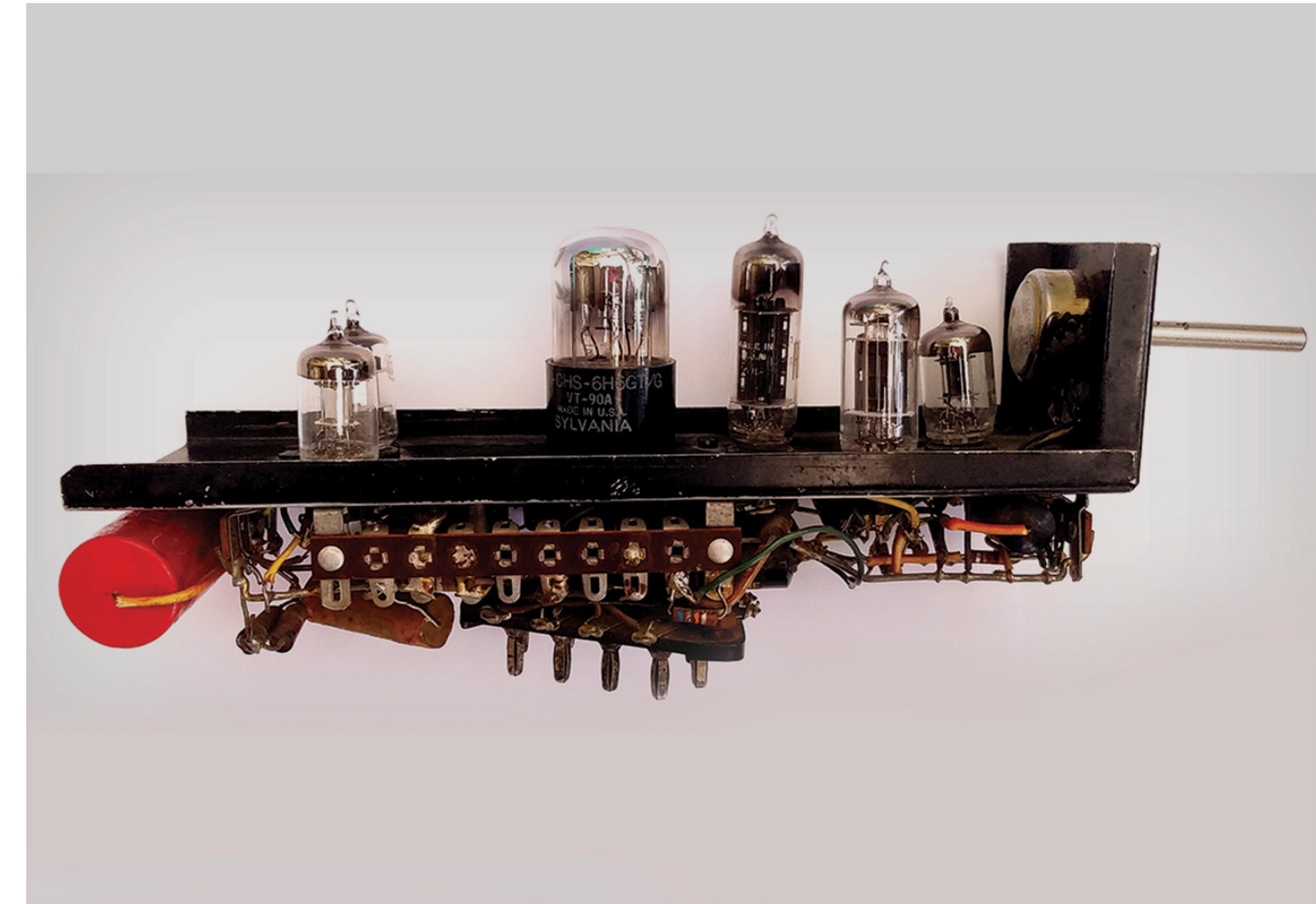
Entered as Second Class Matter, October 1st, 1948, at the Post Office at New York, N.Y.  
under the Act of March 3rd, 1933, and July 2nd, 1946.

Printed in Great Britain

# Marvin Lee Minsky (1927-2016)



# SNARC 1951



## **Arthur Lee Samuel (1901-1990)**

“The field of study that gives computers the ability to learn without being explicitly programmed”

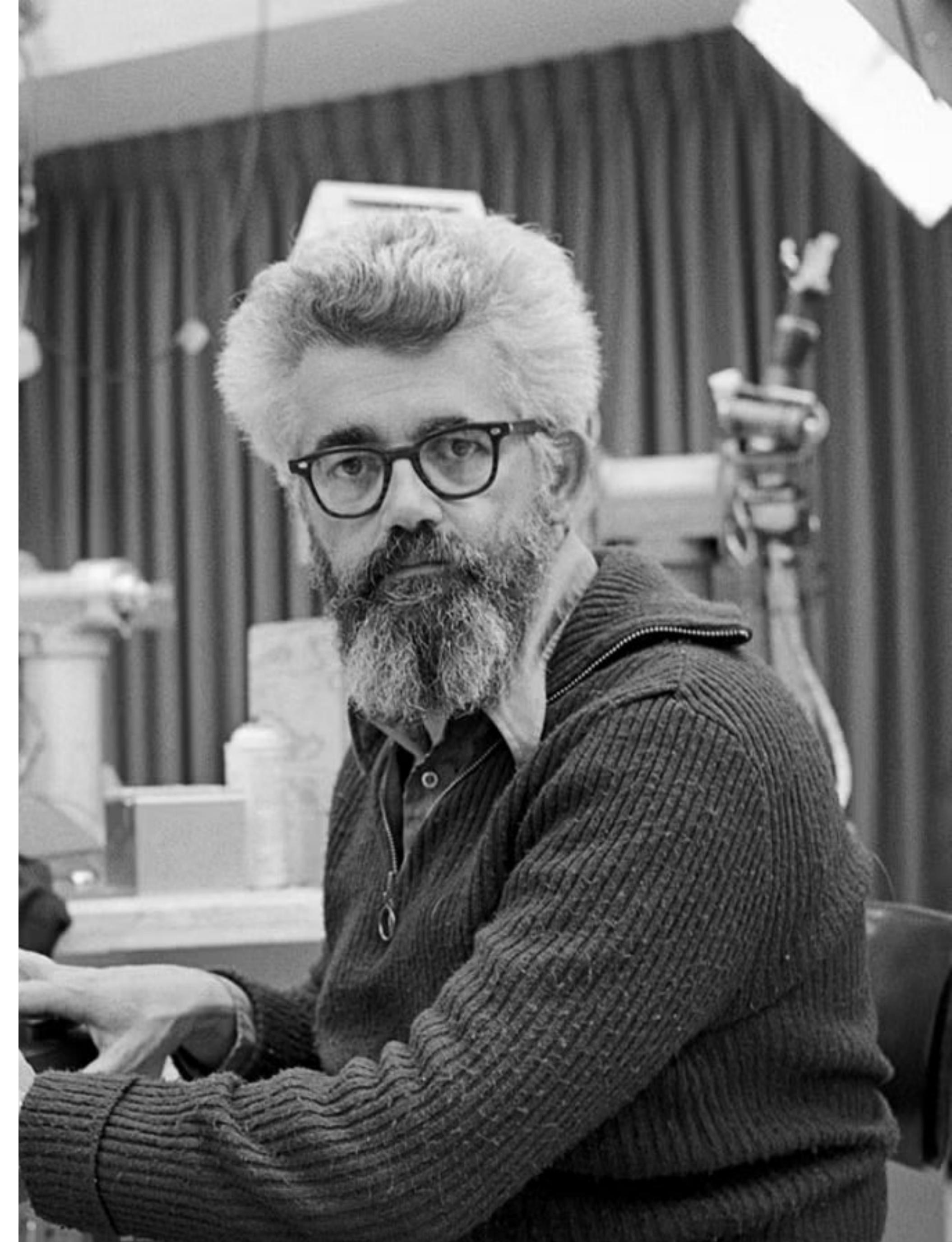




# 1956: The birth of AI

## **John McCarthy (1927-2011)**

Coined the term “Artificial Intelligence” in 1955 as “the science and engineering of making intelligent machines especially intelligent computer programs” and organized the 1956 Dartmouth workshop.



# Dartmouth workshop 1956

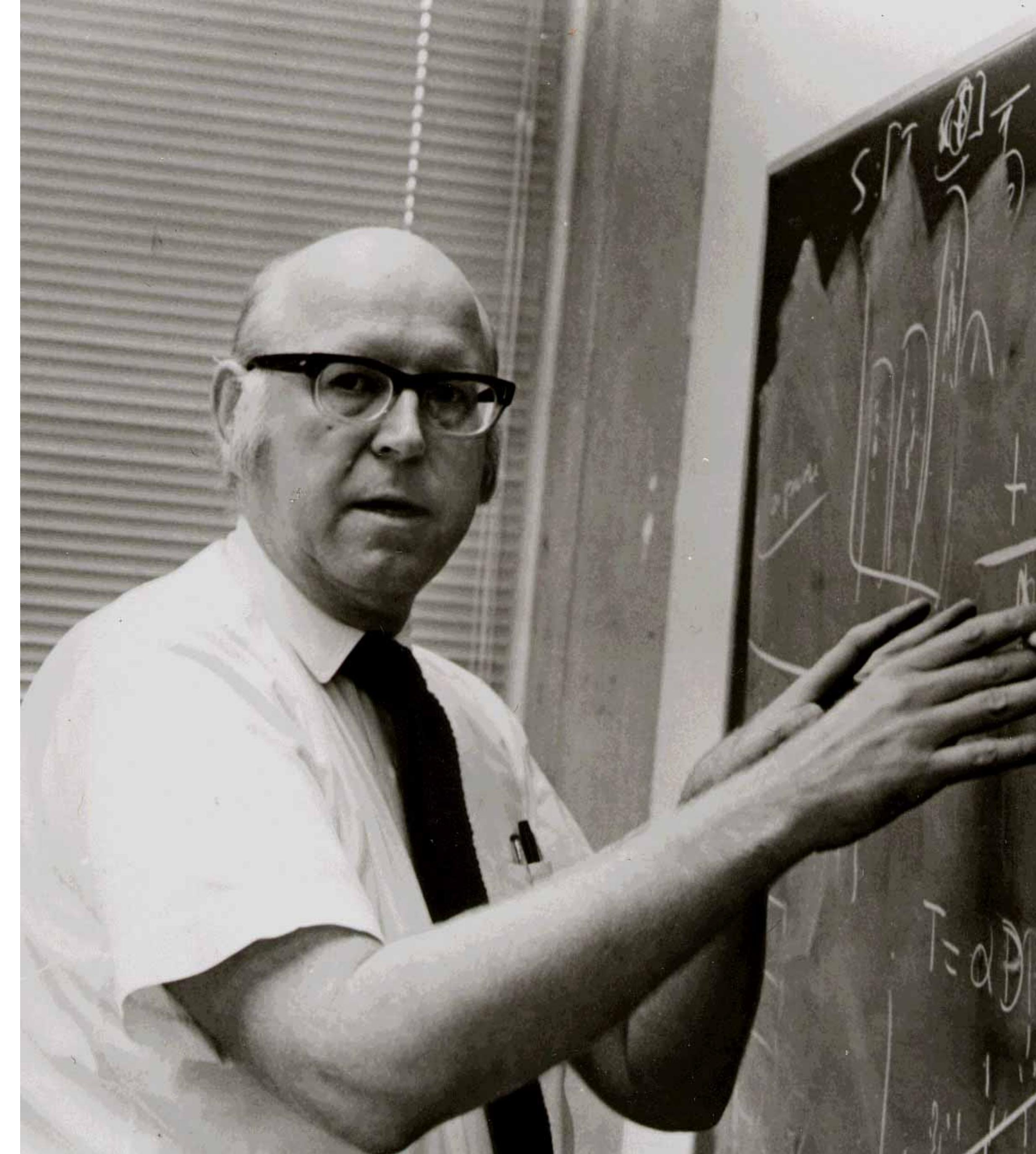
Dartmouth Summer Research Project on Artificial Intelligence proposal states:

An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.

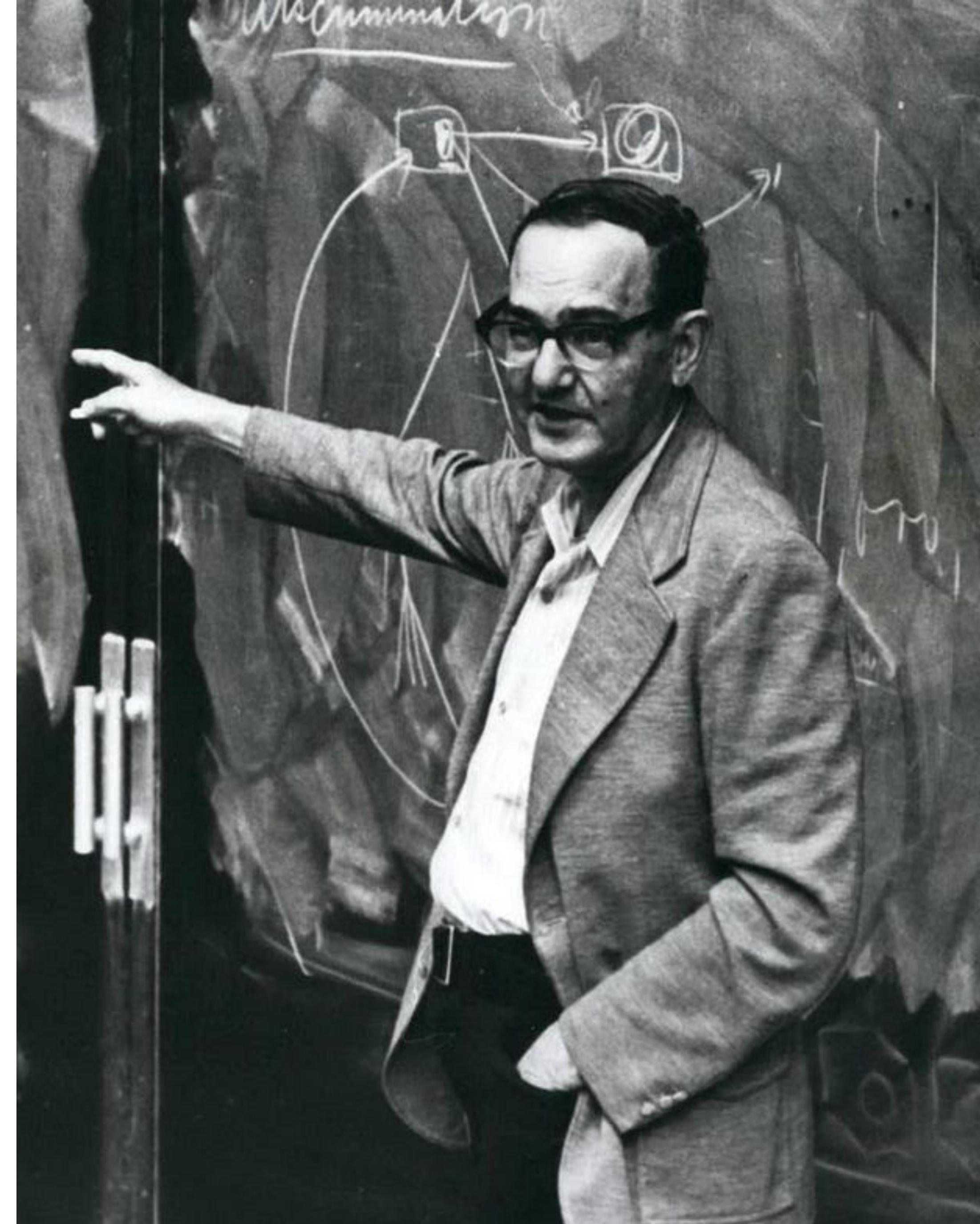


# **1956-1966: Early Success Stories**

## Allen Newell (1927-1992)



# Herbert Alexander Simon (1916-2001)



## Logic theorist 1956

Described as “the first artificial intelligence program” could prove 38 of the first 52 theorems in chapter two of Whitehead and Bertrand Russell's Principia Mathematica, and found new and shorter proofs for some of them.

# PRINCIPIA MATHEMATICA

TO \*56

BY

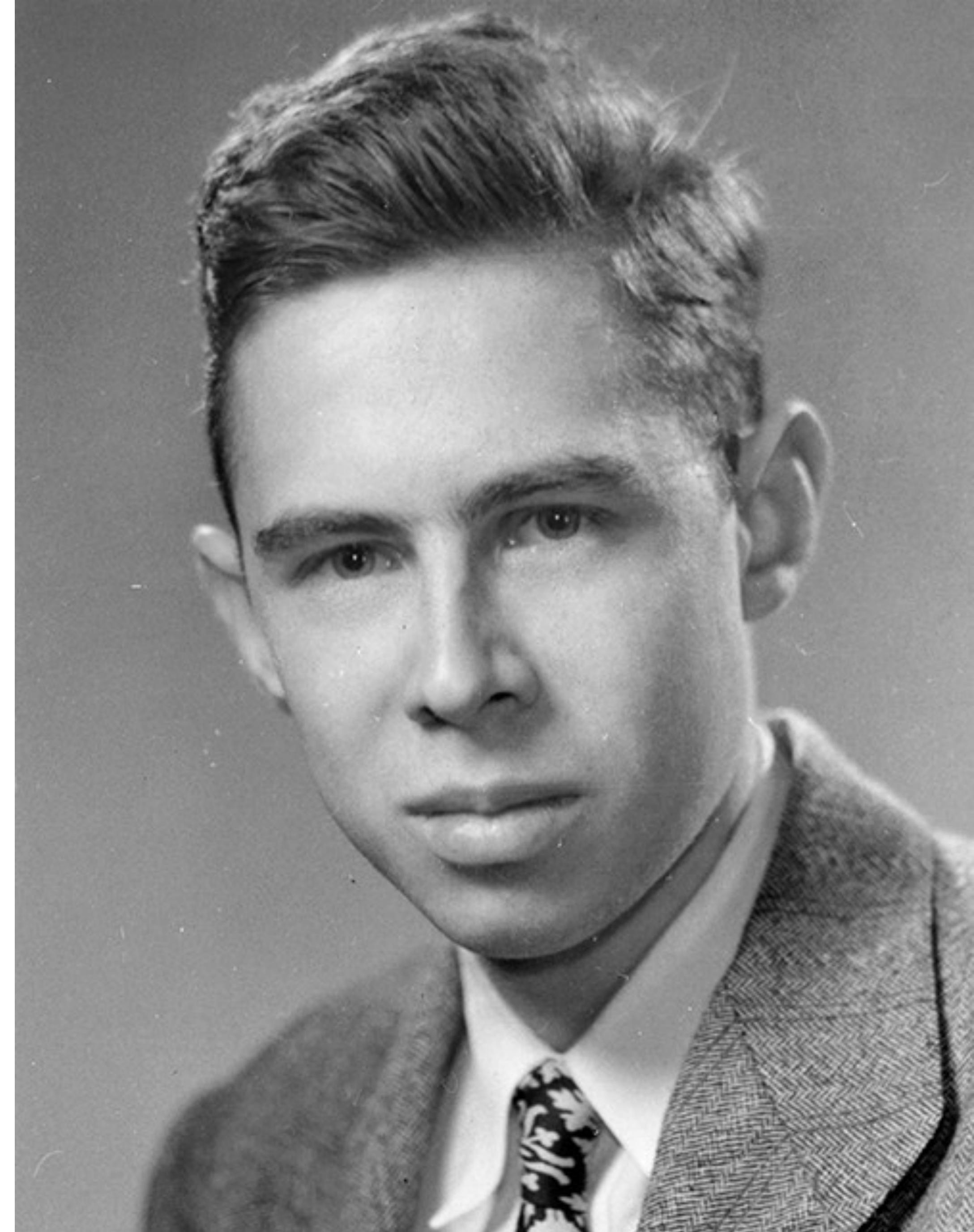
ALFRED NORTH WHITEHEAD  
AND  
BERTRAND RUSSELL, F.R.S.



CAMBRIDGE  
AT THE UNIVERSITY PRESS

## **Frank Rosenblatt (1928-1971)**

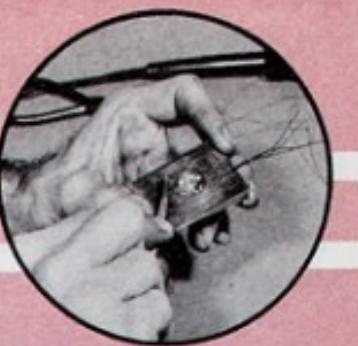
Built the Perceptron in 1957. At first it was a program run on an IBM704.





Vol. VI, No. 2, Summer 1958

**research trends**  
CORNELL AERONAUTICAL LABORATORY, INC., BUFFALO 21, NEW YORK



The Design of an  
*Intelligent AUTOMATON*

by FRANK ROSENBLATT

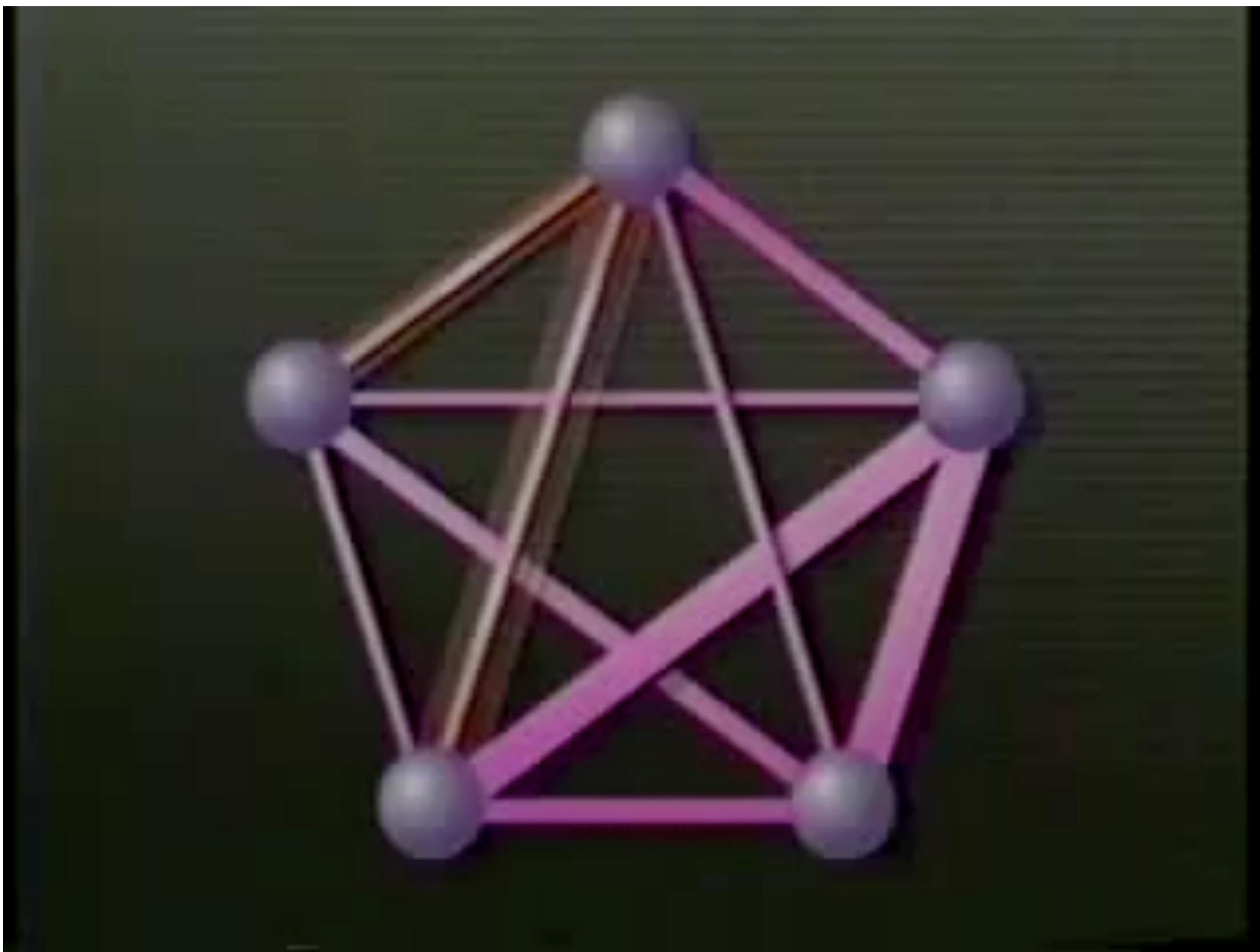
Introducing the perceptron — A machine which senses, recognizes, remembers, and responds like the human mind.

**S**TORIES about the creation of machines having human qualities have long been a fascinating province in the realm of science fiction. Yet we are now about to witness the birth of such a machine — a machine capable of perceiving, recognizing, and identifying its surroundings without any human training or control. Development of that machine has stemmed from a search for an understanding of the physical mechanisms which underlie human experience and intelligence. The question of the nature of these processes is at least as ancient as any other question in western science and philosophy, and, indeed, ranks as one of the greatest scientific challenges of our time. Our understanding of this problem has gone perhaps as far as had the development of physics before Newton. We have some excellent descriptions of the phenomena to be explained, a number of interesting hypotheses, and a little detailed knowledge about events in the nervous system. But we lack agreement on any integrated set of principles by which the functioning of the nervous system can be understood. We believe now that this ancient problem is about to yield to our theoretical investigation for three reasons:

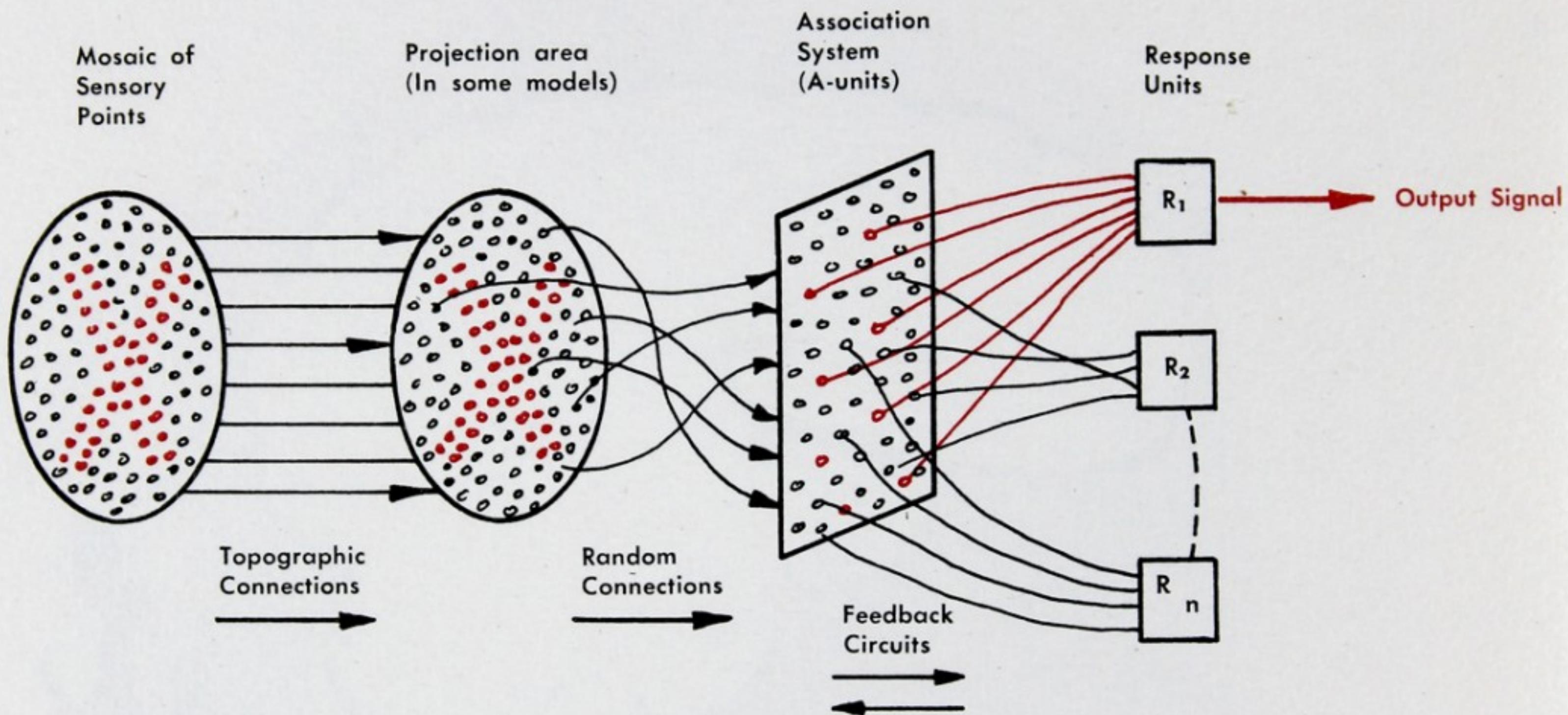
First, in recent years our knowledge of the functioning of individual cells in the central nervous system has vastly increased. Second, large numbers of engineers and mathematicians are, for the first time, undertaking serious study of the mathematical basis for thinking, perception, and the handling of information by the central nervous system, thus providing the hope that these problems may be within our intellectual grasp. Third, recent developments in probability theory and in the mathematics of random processes provide new tools for the study of events in the nervous system, where only the gross statistical organization is known and the precise cell-by-cell "wiring diagram" may never be obtained.

**Receives Navy Support**

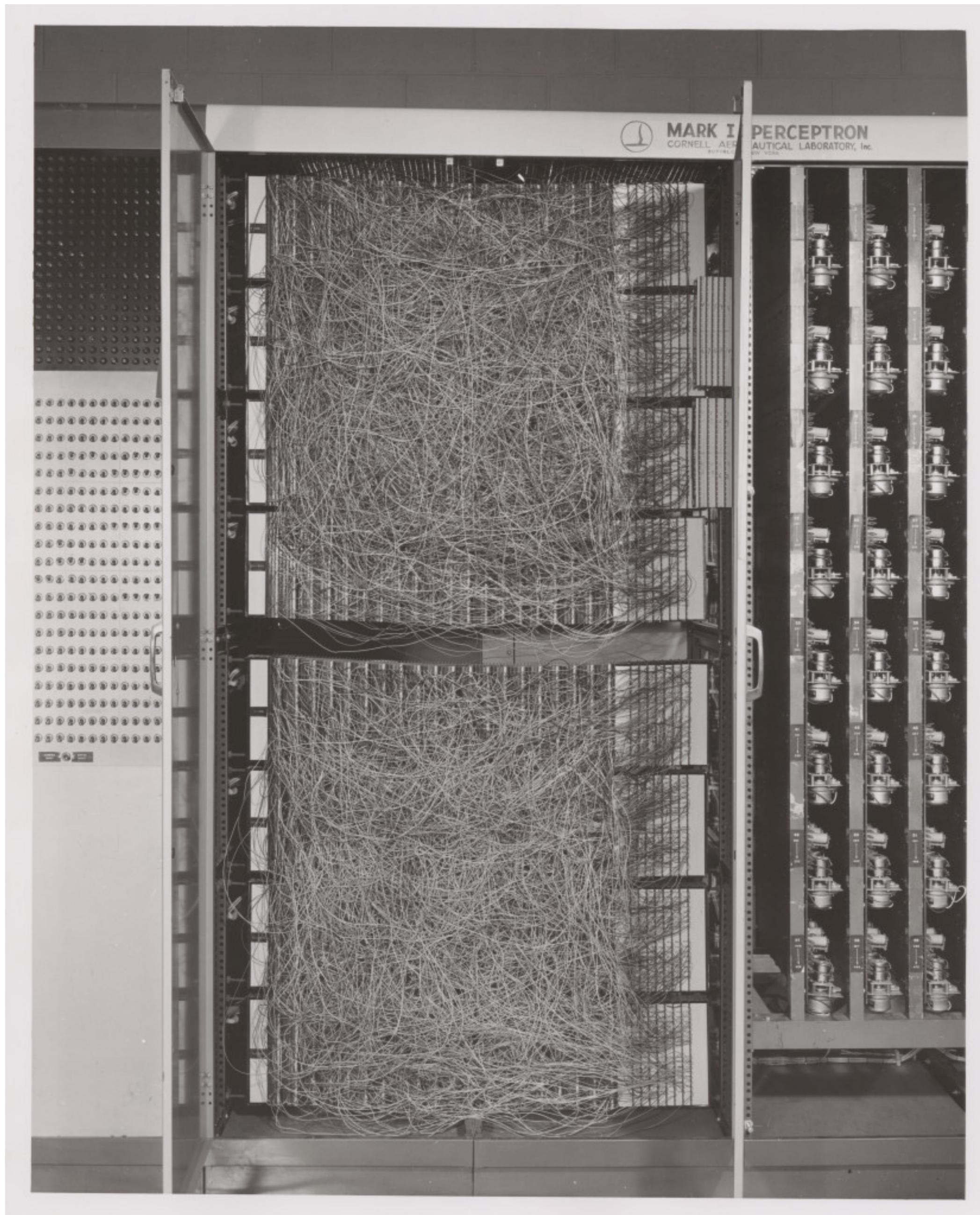
In July, 1957, Project PARA (Perceiving and Recognizing Automaton), an internal research program which had been in progress for over a year at Cornell Aeronautical Laboratory, received the support of the Office of Naval Research. The program had been concerned primarily with the application of probability theory to



**FIG. 1 — Organization of a biological brain. (Red areas indicate active cells, responding to the letter X.)**

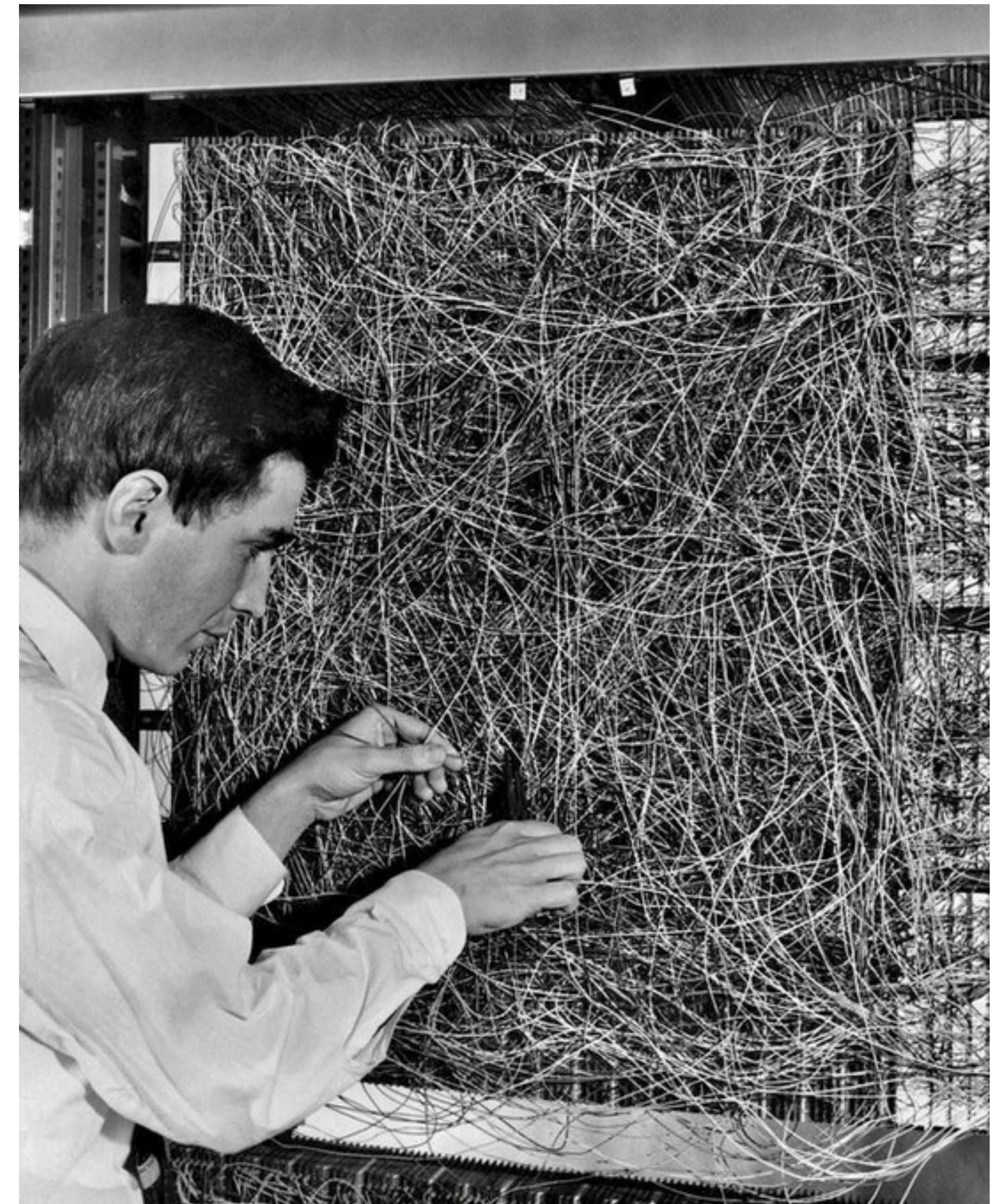


**FIG. 2 — Organization of a perceptron.**



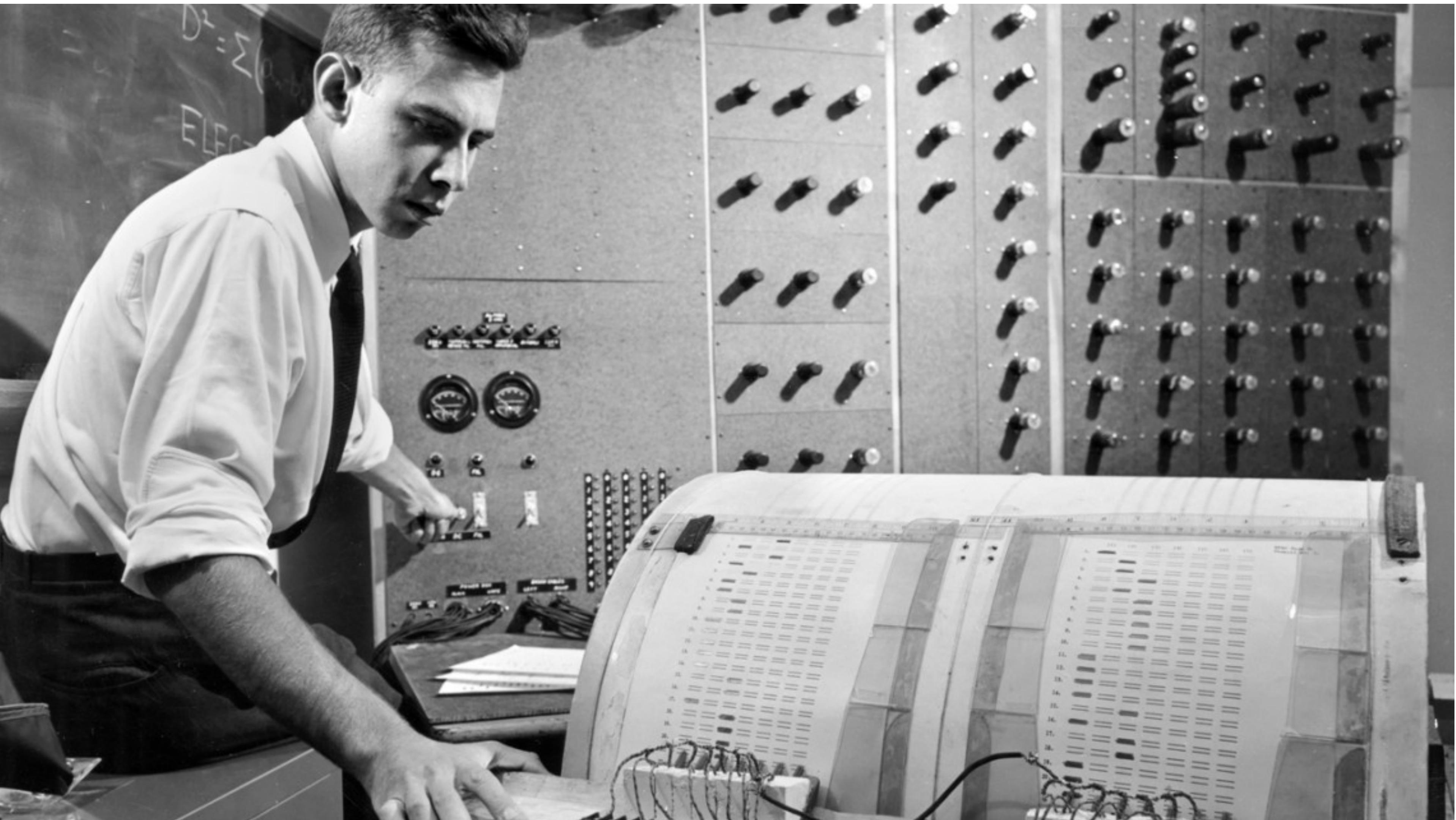
67

Amir Zare



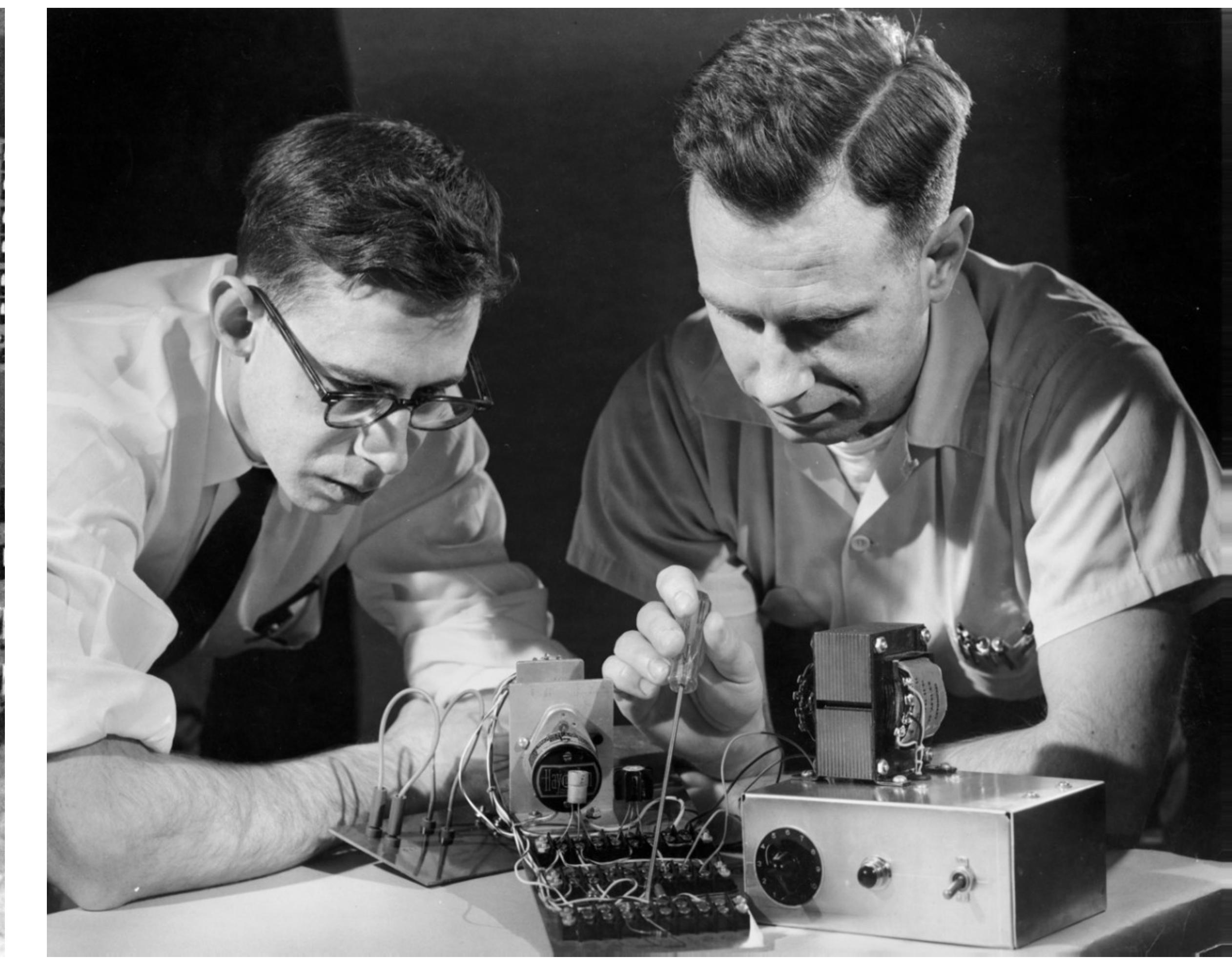
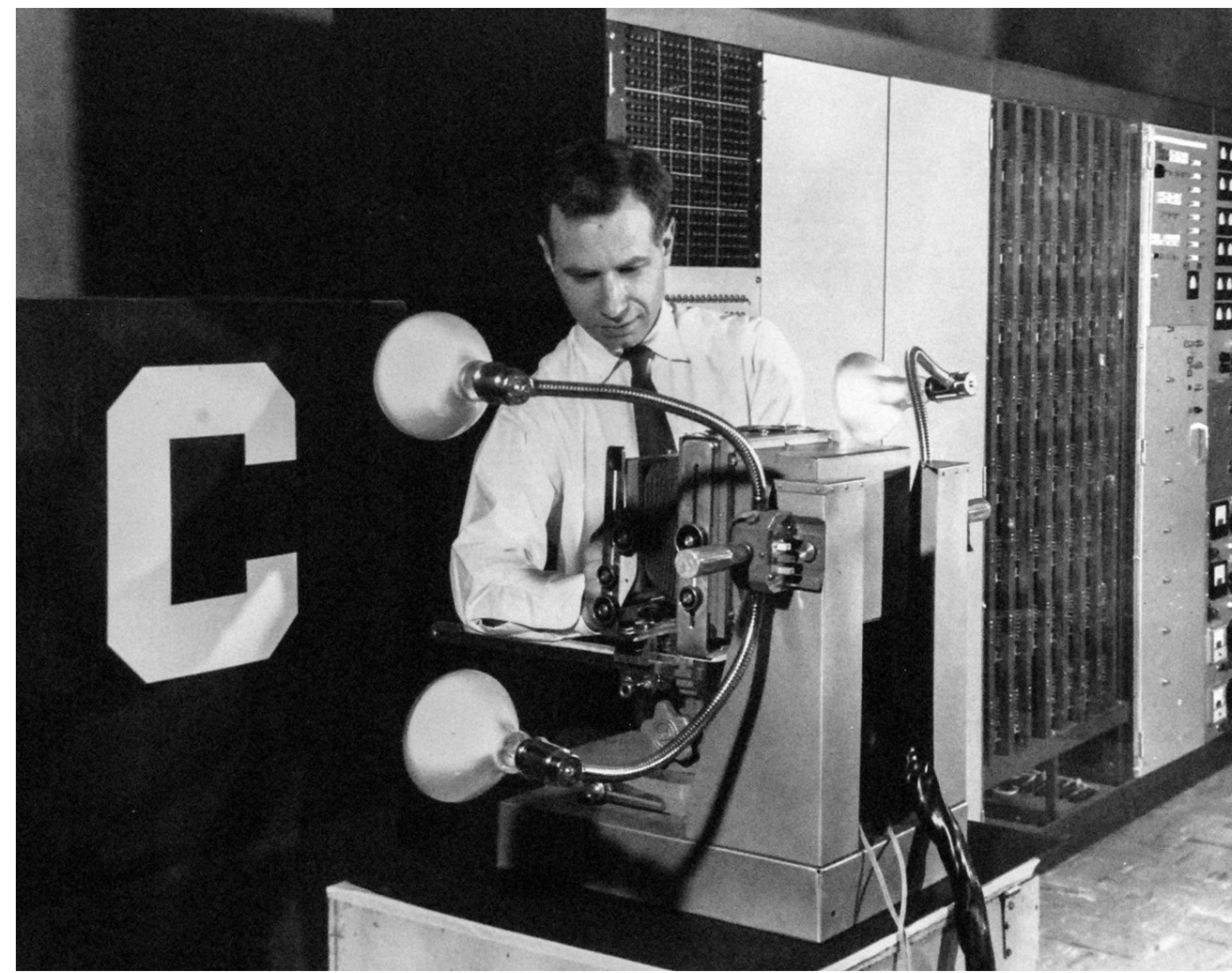
AI

History of AI



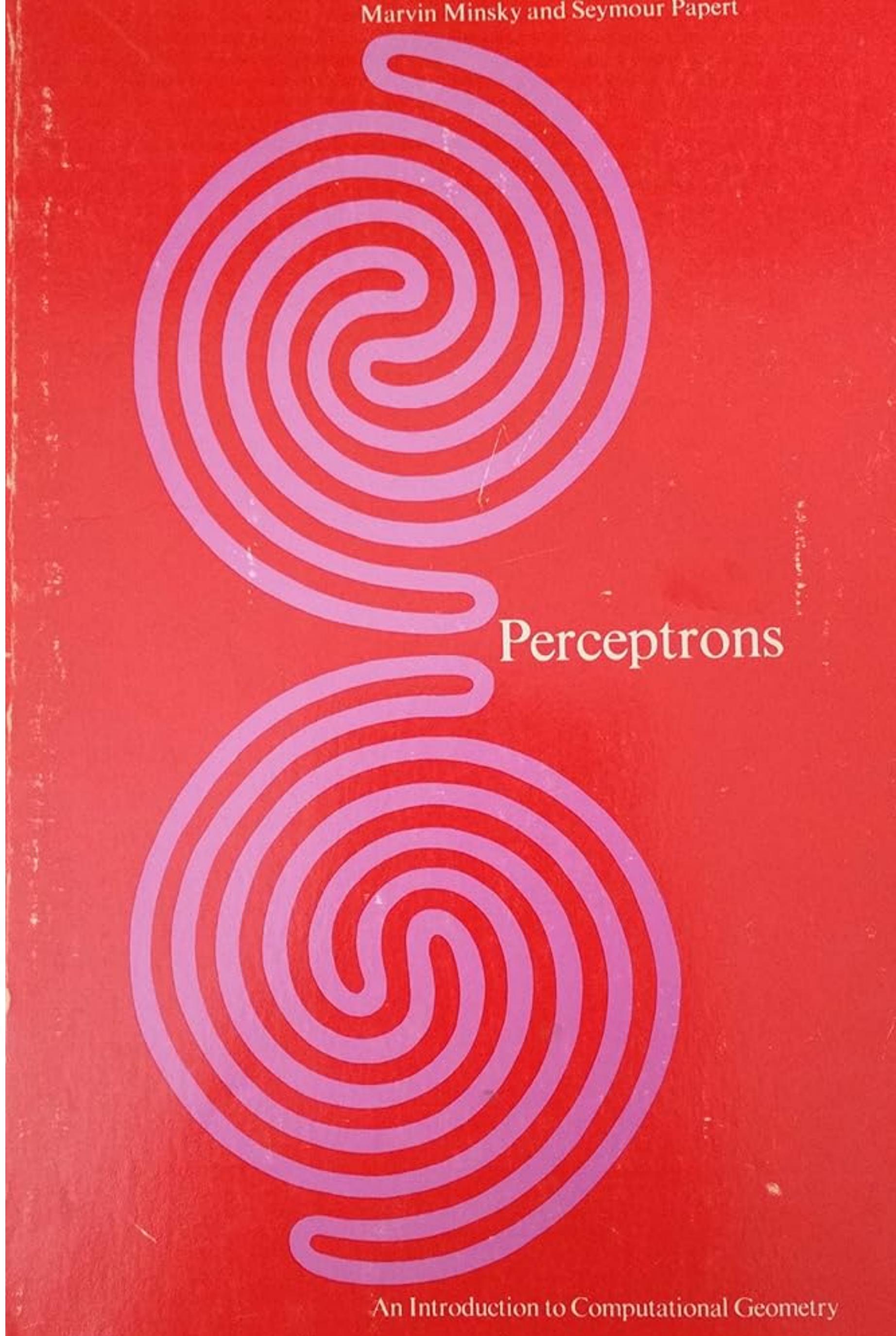
COMPUTER





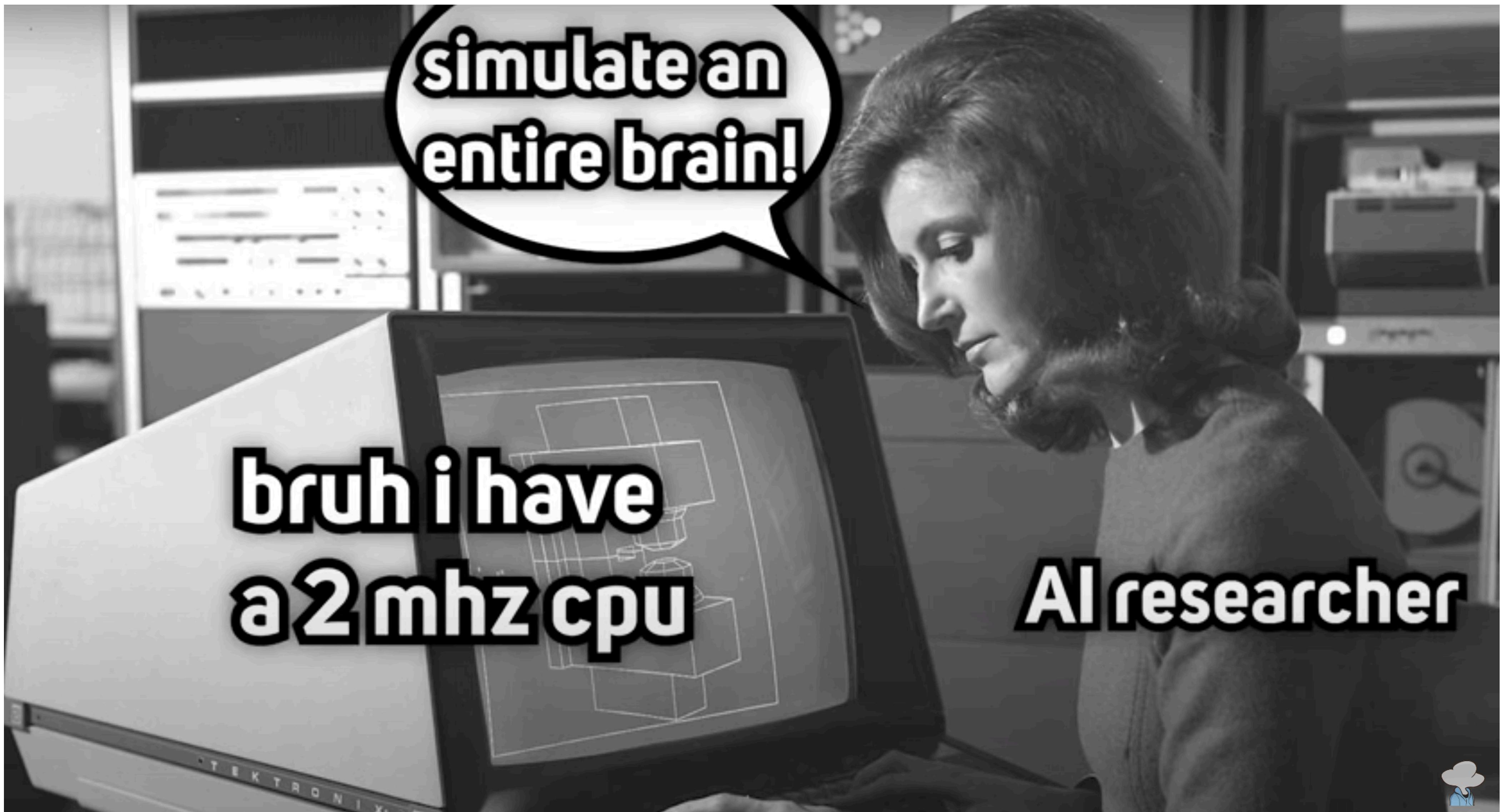
## Perceptron (1969)

By Minsky and Pappert heavily criticized perceptron and connectionism,



An Introduction to Computational Geometry

# **1974-1980: The First AI Winter**



# 1980-1987: Expert Systems

# **1987-1993: The Second AI Winter**

# **1993-Present: The Age of Neural Networks**

## **Deep blue by IBM (1996-1997)**

First time machine was able to beat a world chess champion (Garry Kasparov)





## Game 6 of 1997 remacth

Final position after 19.c4



# AlphaGo by Google (2016)

Beat World Go champion (Lee Sedol)

