NAME THE FIRST ELECTRONIC DIGITAL COMPUTER?

1)ENIAC?
2)UNIVAC?
3)Colossus?
4)Zuse Z1~Z3?

WHAT IF THE ANSWER WAS 5) NONE OF THE ABOVE?

1)ENIAC?
2)UNIVAC?
3)Colossus?
4)Zuse Z1~Z3?
5)None of the above

WHAT THEN MIGHT IT BE?

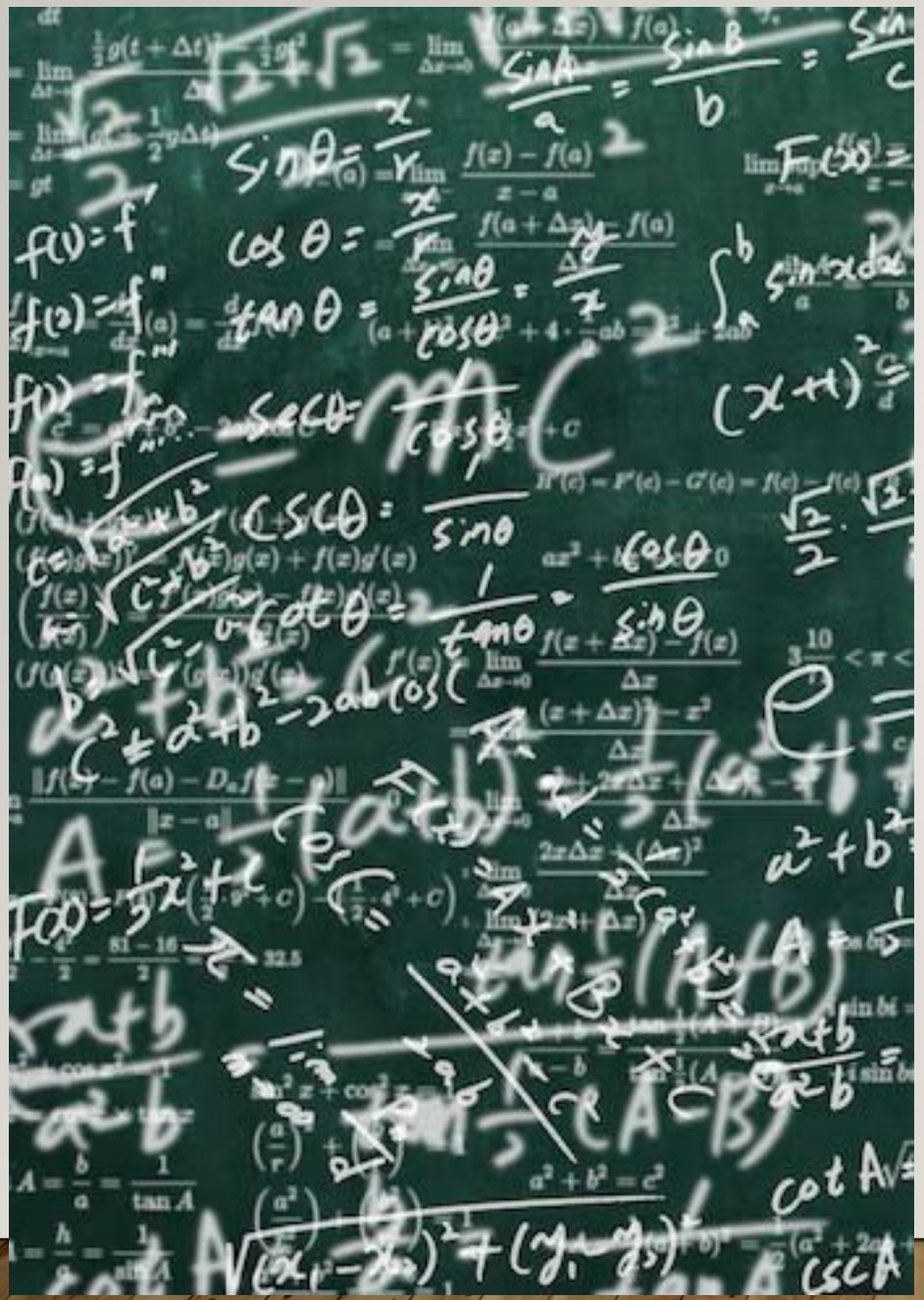
The Atanasoff Berry Computer (ABC)?

John Vincent Atanasoff

1925 BS EE from University of Florida
1926 MS Mathematics from Iowa State College
1930 PhD Theoretical Physics Uni. of Wisconsin

Then returned to teach at Iowa State College.

At age 9 he taught himself to use his fathers slide rule. Understanding it used logarithms he wanted to learn more. His mother taught him basic algebra so he could better understand his parent's college textbooks.



Professor Atanasoff watched his graduate students struggle, taking weeks to manually solve equations. This reminded him of the quality time spent with a Monroe calculator when working on his thesis, "The Dielectric Constant of Helium".

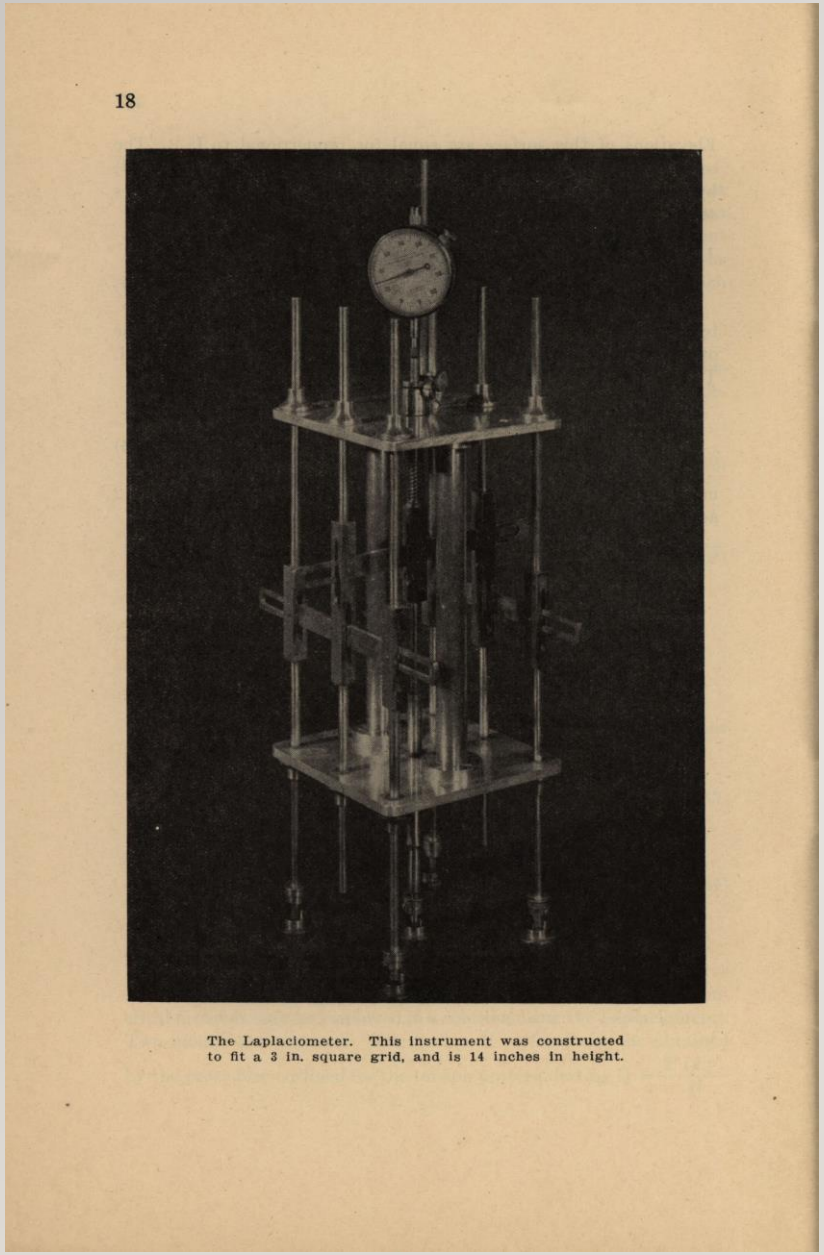
There had to be a better way.

(1934-1937)

A first attempt at more efficient scientific computation was to add accoutrements to an IBM tabulator to analyze complex spectra.

This resulted in a paper authored with A. E. Brant on the subject which annoyed IBM.

No IBM tabulators were harmed ☺



Students Lynn A. Hannum and Atanasoff developed the 'Laplcaiometer', an analog method for solving Laplace's equations in two dimensions.

A good step forward but still lacking.

LITERATURE SURVEY

ANALOG COMPUTERS:

Number represented by physical quantity as measured by some system of units.

1) Slide rule
2) Bush Diff. Analyzer
3) Harmonic Analyzer
4) Laplaciometer

"Generally limited to three or more base-10 places. Setting up some special problems is arduous, and even the most expensive of analog machines, the Bush Differential Analyzer, was limited in the problems it could accept." **- JVC**

LITERATURE SURVEY

DIGITAL COMPUTERS:

Number represented by a discrete value. Generally, in Base-10.

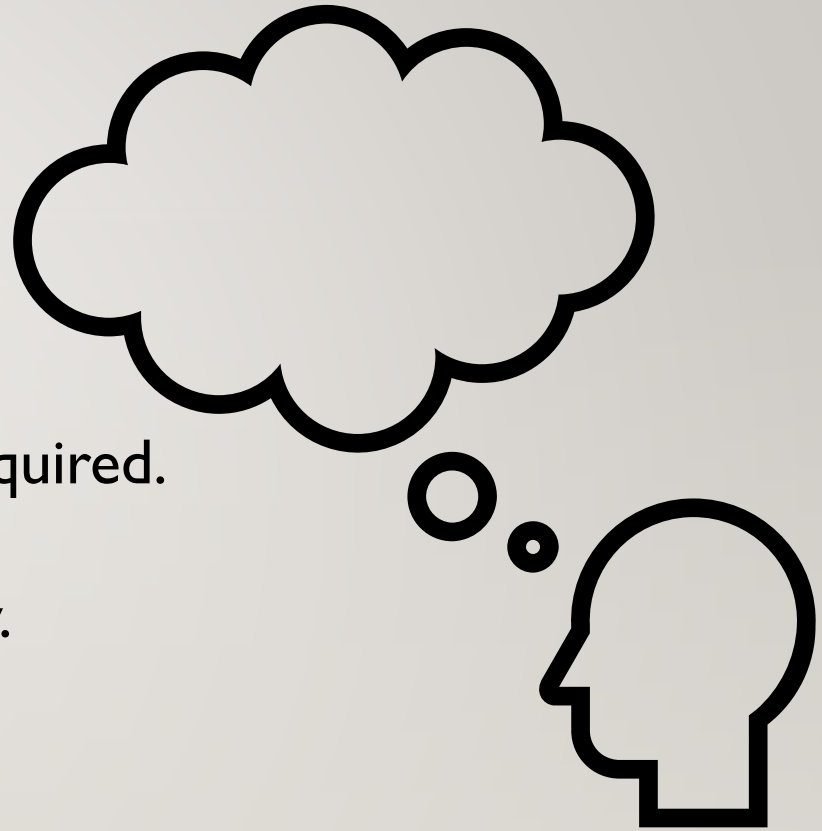
1) Abacus
2) Adding machines
3) Monroe, etc.
4) Tabulators

Complex, limited capacity and limited memory.

Idea: Mechanically ganging a tabulator and multiple Monroe machines together for increased capacity would make for machine that was mechanically complex and hard to set up and use without error.

(1936-1938) Properties of a new digital computer?

1) Add/Subtract w/carry
    1) Mult./Div. could be done w/add./sub.
2) Medium; mechanical or electrical?
    1) Electrical. Tubes perhaps?
3) Base of operation?
    1) Calculated most efficient base for operations required.
4) Memory.
    1) Tabulator 266 bits. Needed much larger capacity.
    2) Implementation: Mechanical, electromechanical, ferromagnetic, tubes, condensers?



Eureka!

Atanasoff grew frustrated by the lack of progress. One evening in the winter of 1937 he jumped in his Ford V8 and hit the highway at a high rate of speed having to concentrate on driving, no computing.

After some hours of driving, he found himself at the border of Illinois. He crossed the Mississippi river and pulled into a roadhouse for a drink. With a clear head we was able to make four key decisions about his computing machine.

1) I would use electricity and electronics as the media for the computer.
2) In spite of custom, I would use base-2 numbers (binary) for my computer.
3) I would use condensers for memory, but 'regenerate' to avoid lapses.
4) I would compute by direct logical action, not by enumeration.

Motivation

$$5x - 2y - 3z = -7$$

$$2x - 3y + z = -16$$

$$3x + 4y - 2z = 7$$

Approximating solution to partial differential equations by solving system of linear algebraic equations.

Three equations in three unknowns might not be a challenge but Atanasoff was thinking of system of 20 equations in 20 unknowns or larger.

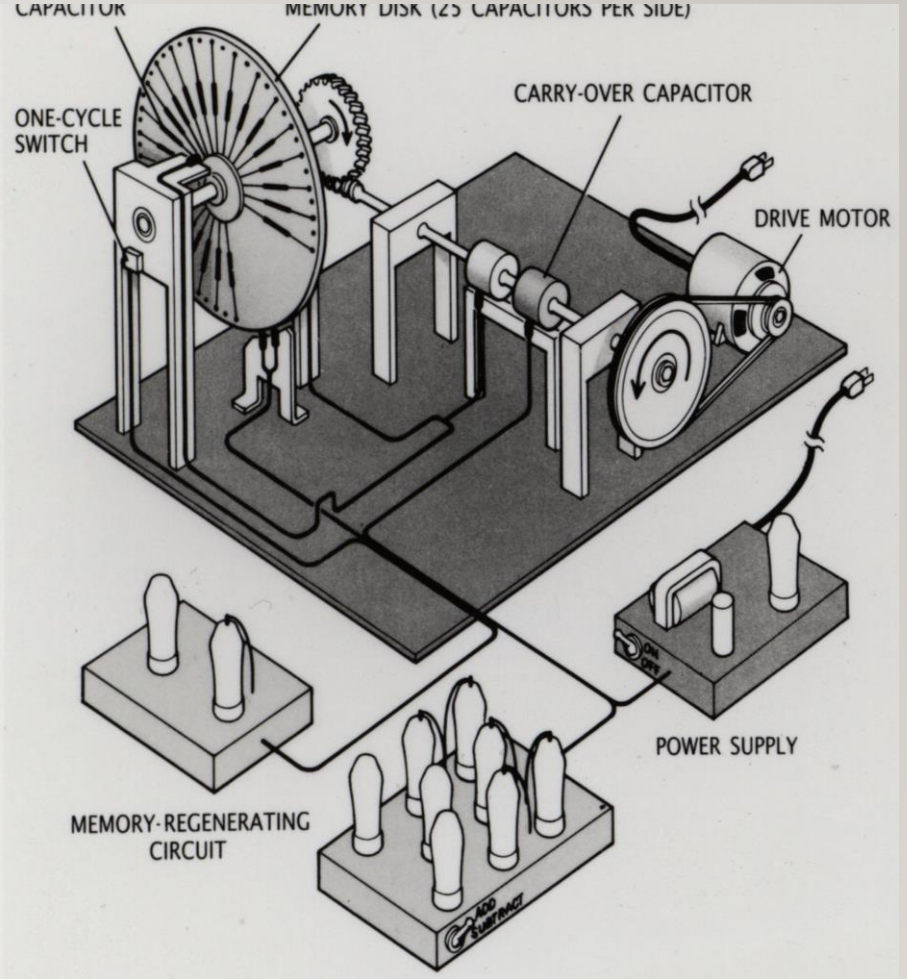
(1939) Design and prototype construction

It did use the binary number system.
Memory made of small paper condensers.
Weeks to design logic system using tubes.

Secured $650 grant from ISC for construction of prototype.

Hired Cliff Berry spring 1939 work on prototype started fall 1939. Working by end of 1939.

35-page manuscript created to seek additional funds.

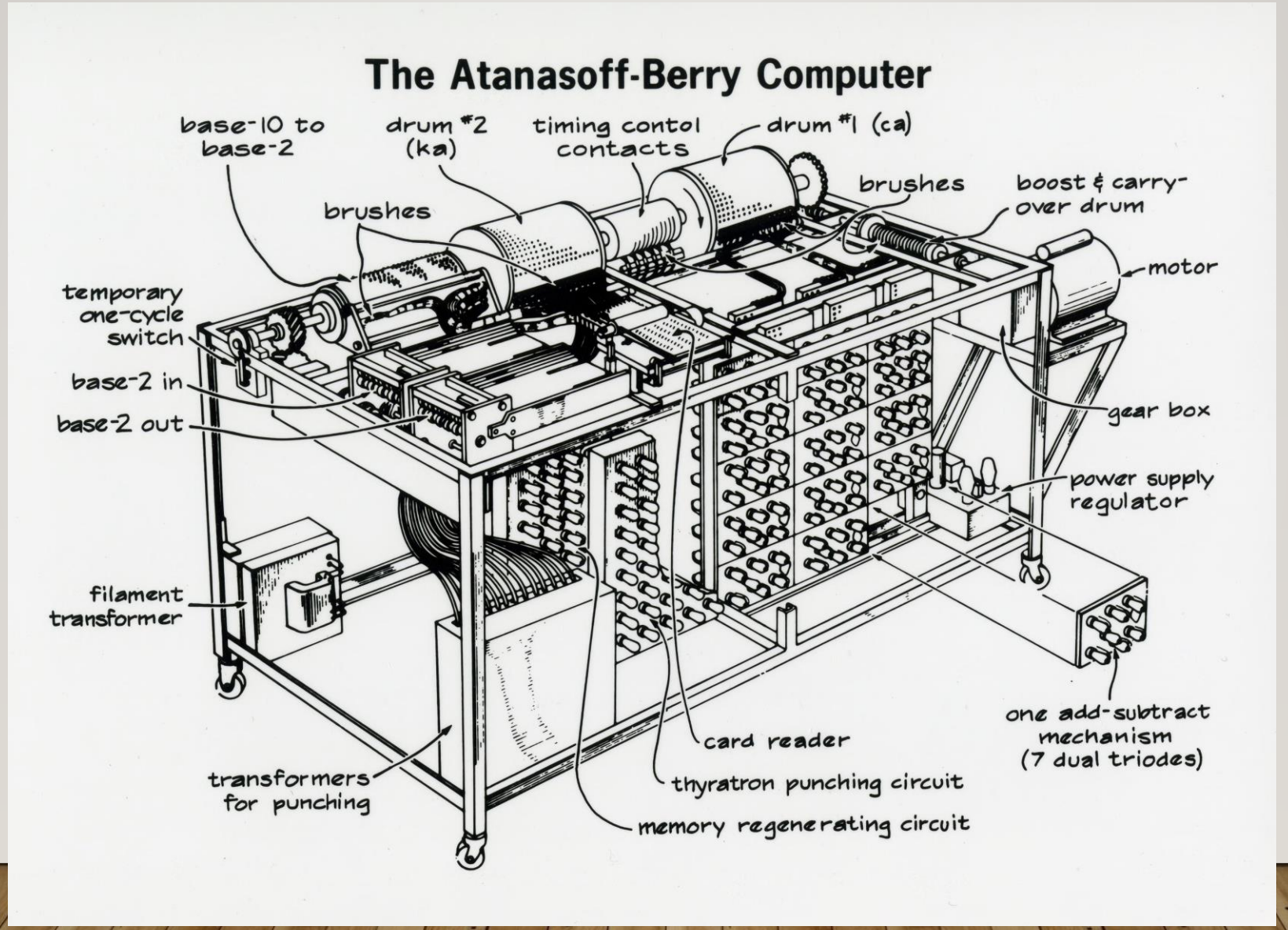


(1940-1942) Construction of ABC

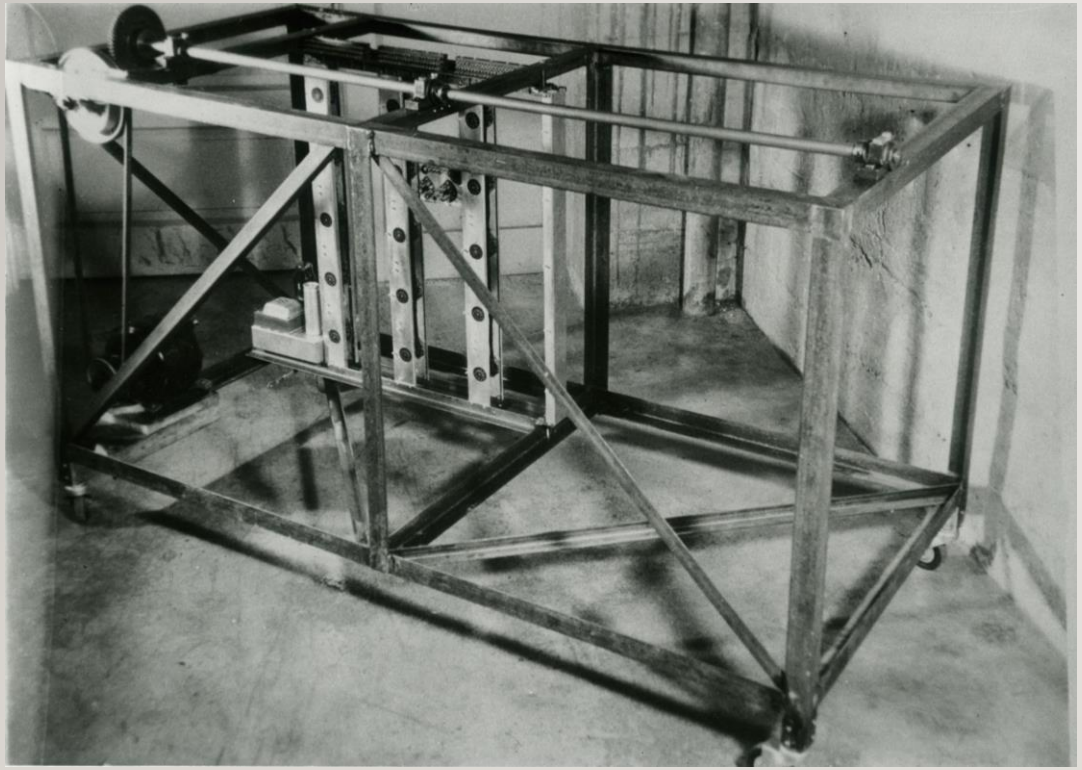
$5300 grant from Research Corporation

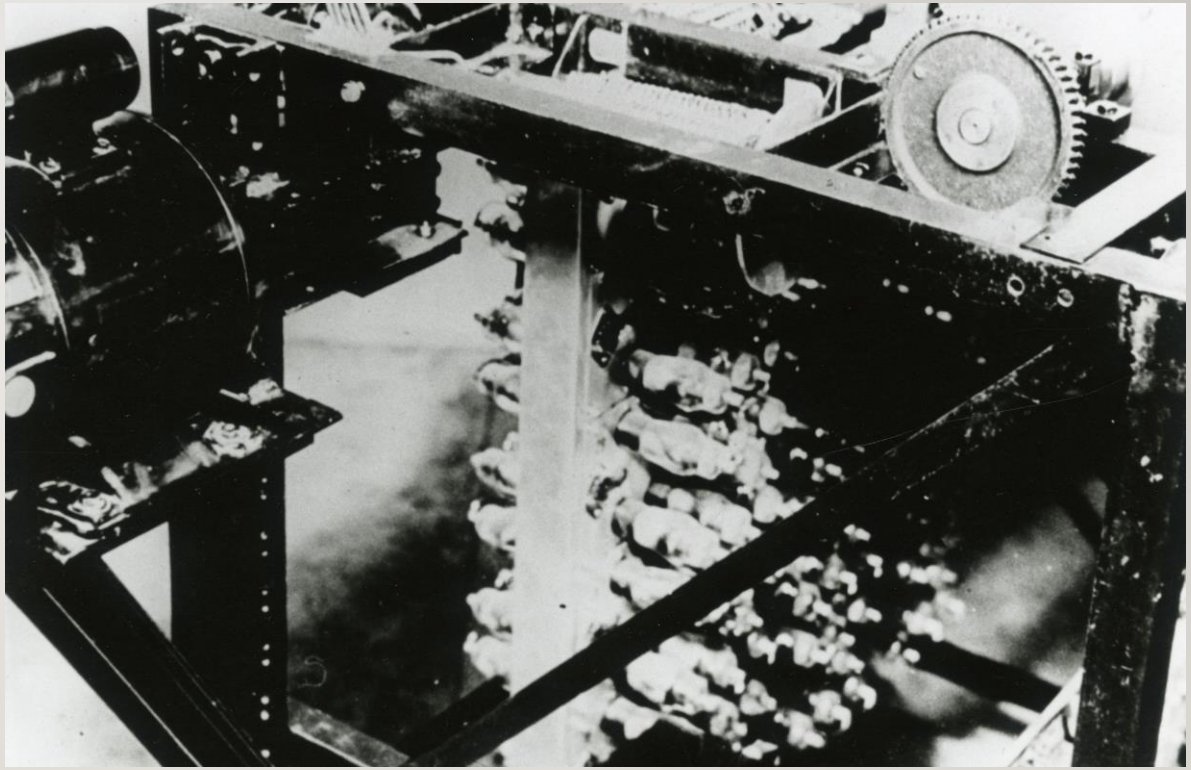
- ABC about the size of an office desk.
- Designed to solve 29 equations in 29 unknowns
- 3000 bits of regenerative capacitive memory
- Calculation speed ~30x largest IBM tabulator
- Input via IBM punch cards in base-10
- Automatically converted base-10 input to base-2
- Intermediate storage by electrically punched base-2 cards
- Output by dials in base-10

(1940-1942) Construction of ABC

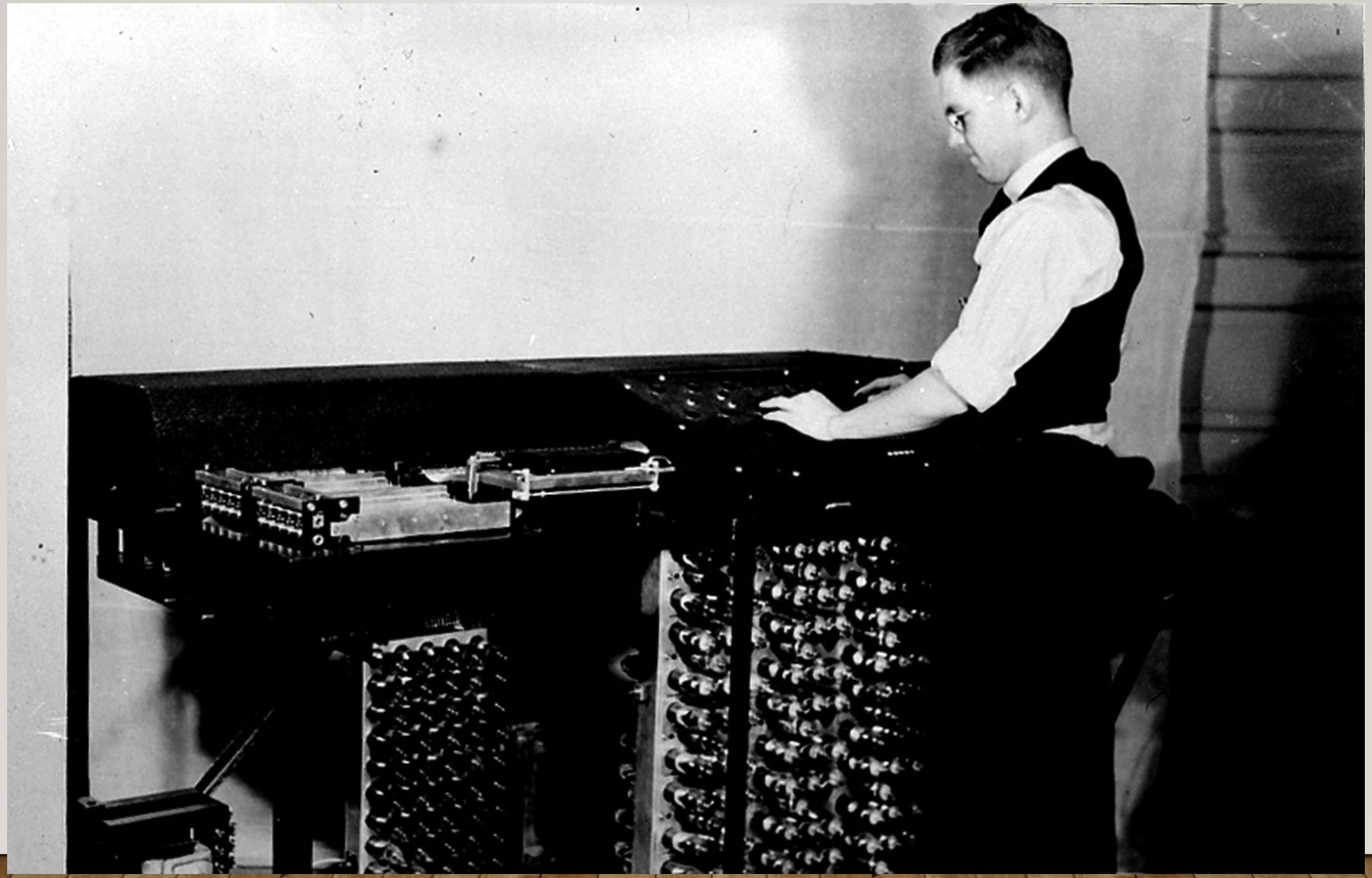


(1940-1942) Construction of ABC





(1940-1942) Construction of ABC

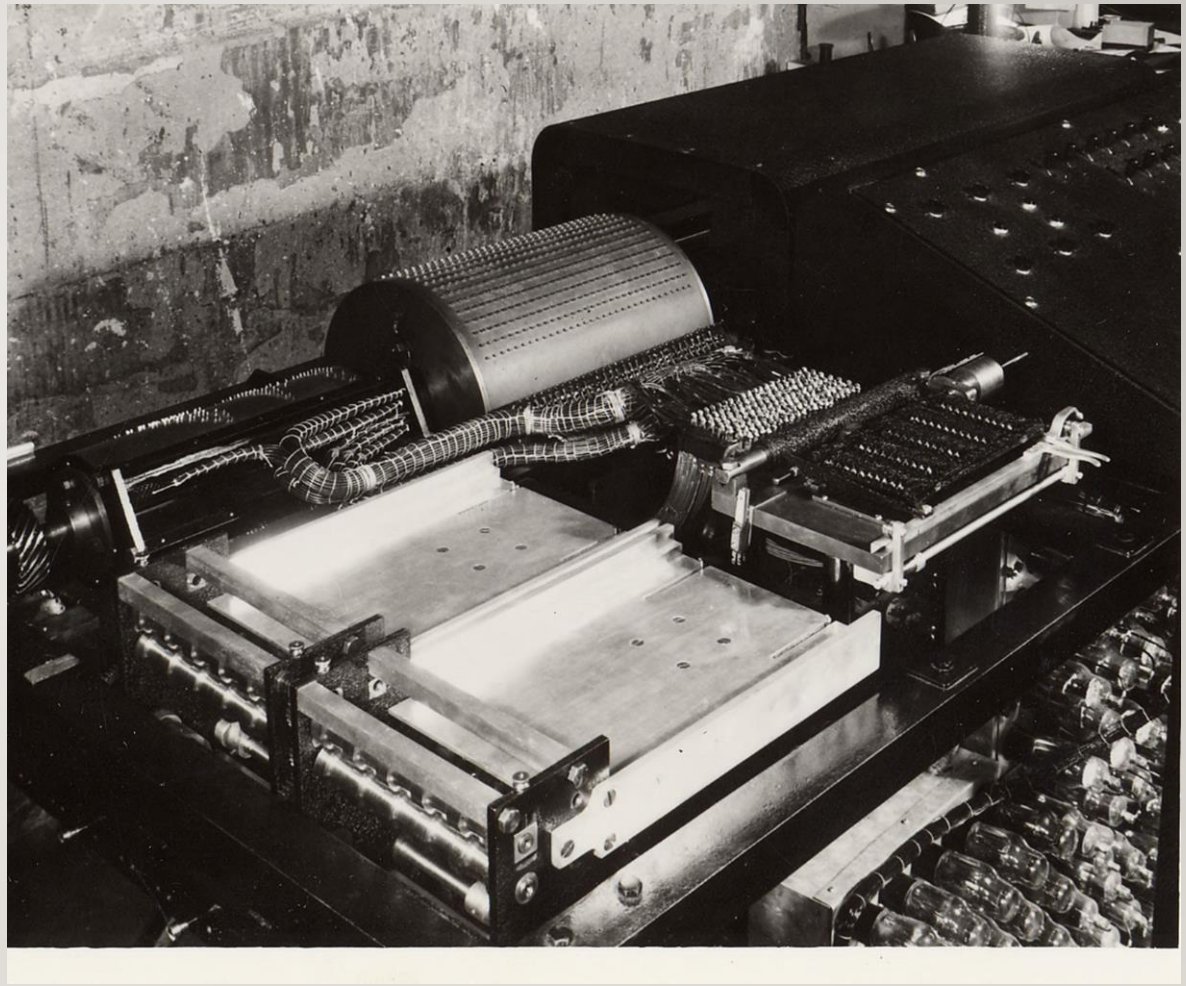


(1940-1942) Construction of ABC

The binary card punch/reader was the only lingering issue as of 1942. The choice of media was critical so that the electrical punch worked properly and could be read reliably.

Testing shows a single bit error every 10^4 to 10^5 bits which inhibited larger sets of equations from being run with confidence.

Suitable stock was then found on campus, but its source was unknown.

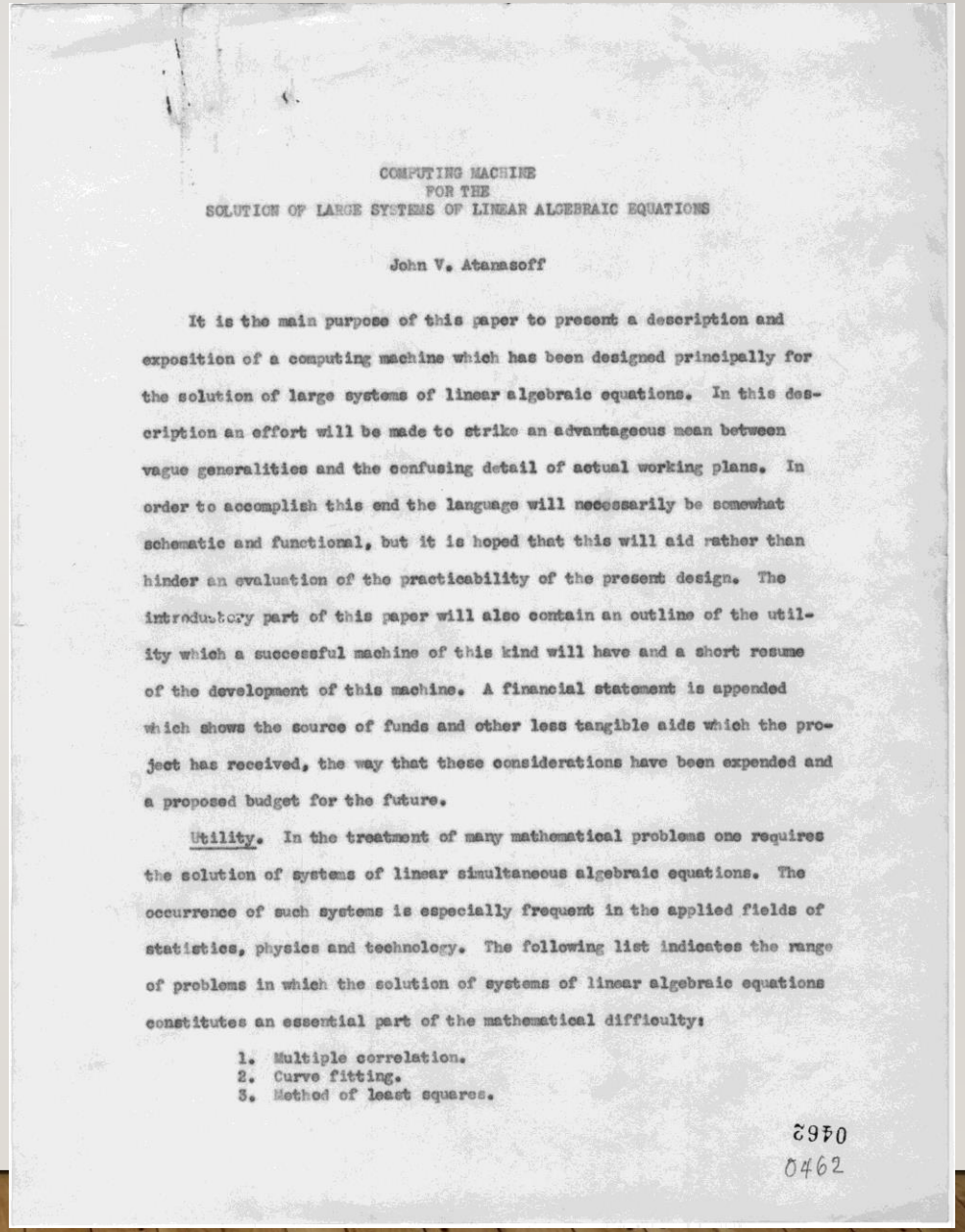


(1940-1942) Construction of ABC

In May of 1941 Mauchly visits Atanasoff at Iowa for 5 days staying as his houseguest. Atanasoff and Mauchly discussed the ABC in detail. Mauchly spent much time with the machine and helped Berry work on it.

He reviewed Atanasoff's design manuscript and asked for a copy which was denied as a patent application was in the works. He then asked for paper on which to make notes.

As of Mauchly's visit was mostly complete and was functional.



COMPUTING MACHINE
FOR THE
SOLUTION OF LARGE SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS

John V. Atanasoff

It is the main purpose of this paper to present a description and exposition of a computing machine which has been designed principally for the solution of large systems of linear algebraic equations. In this description an effort will be made to strike an advantageous mean between vague generalities and the confusing detail of actual working plans. In order to accomplish this end the language will necessarily be somewhat schematic and functional, but it is hoped that this will aid rather than hinder an evaluation of the practicability of the present design. The introductory part of this paper will also contain an outline of the utility which a successful machine of this kind will have and a short resume of the development of this machine. A financial statement is appended which shows the source of funds and other less tangible aids which the project has received, the way that these considerations have been expended and a proposed budget for the future.

Utility. In the treatment of many mathematical problems one requires the solution of systems of linear simultaneous algebraic equations. The occurrence of such systems is especially frequent in the applied fields of statistics, physics and technology. The following list indicates the range of problems in which the solution of systems of linear algebraic equations constitutes an essential part of the mathematical difficulty:

1. Multiple correlation.
2. Curve fitting.
3. Method of least squares.

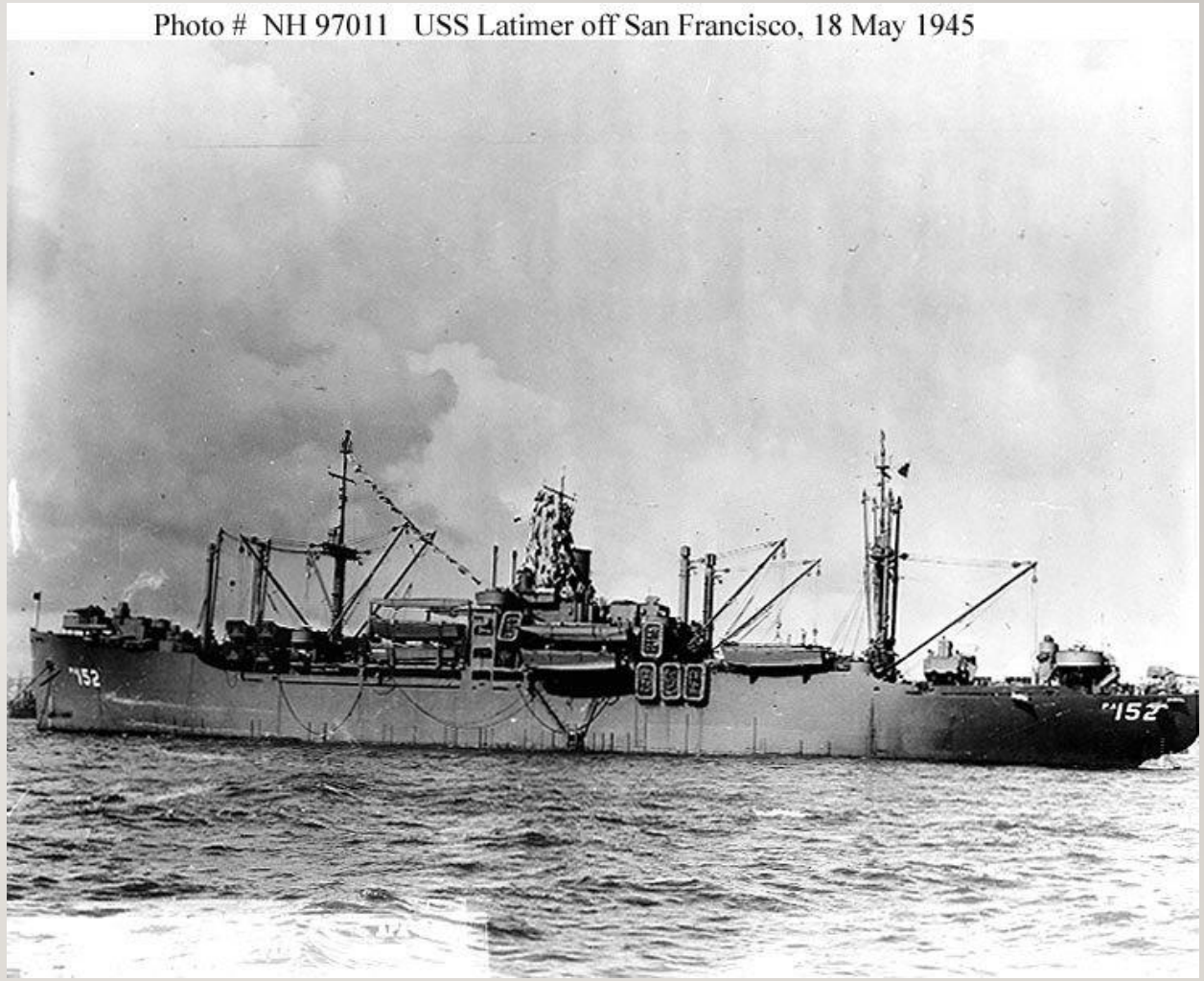
2970
0462

(1940-1942) Construction of ABC

On 7, December 1941 everything changed. The USA was now at war.

In 1942 Atanasoff left ISC for a wartime job at the Naval Ordnance Laboratory. Berry graduated and left for a job with a military supplier.

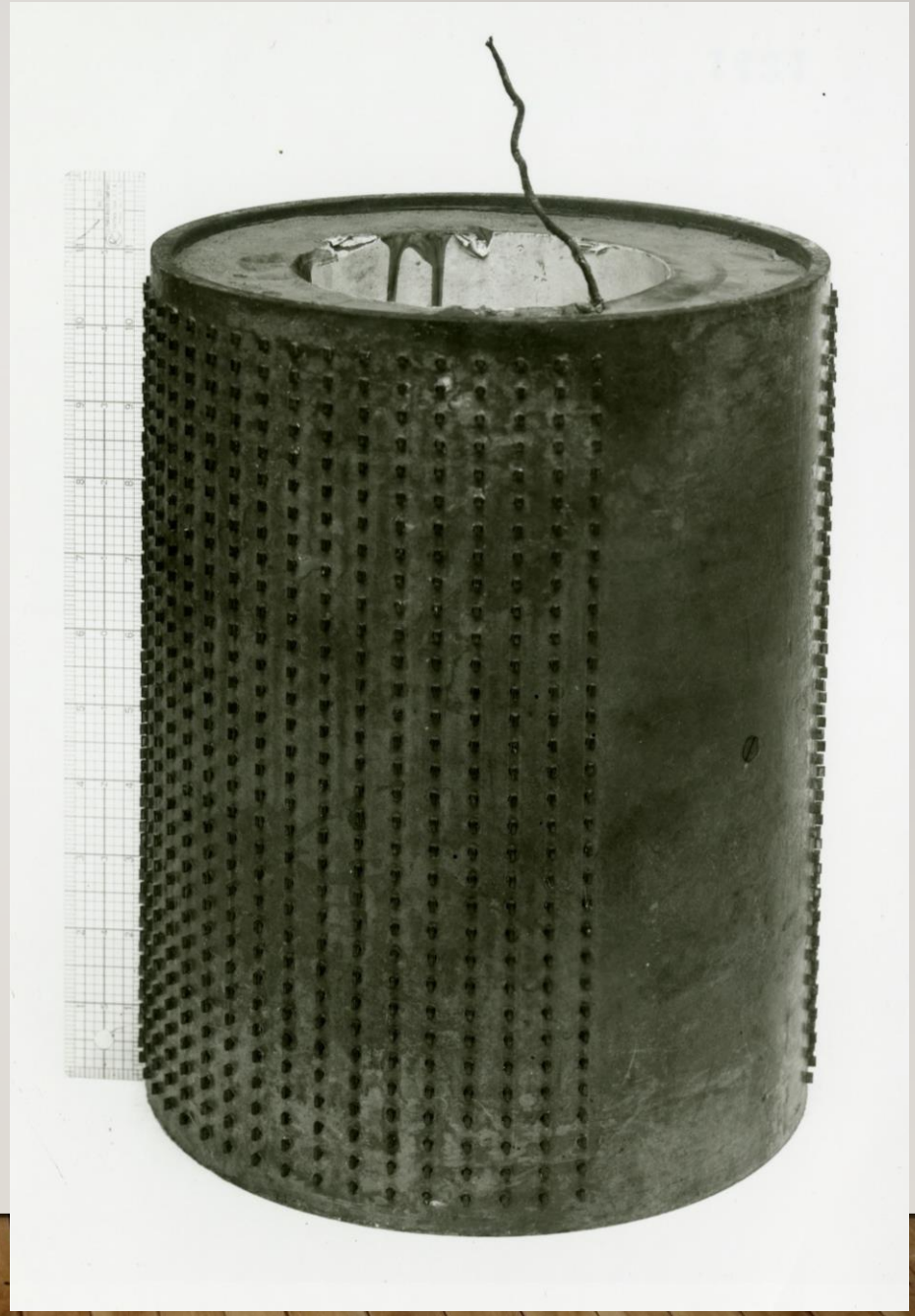
Large change over in staff and lack of foresight at ISC led to them never following through with patent application.



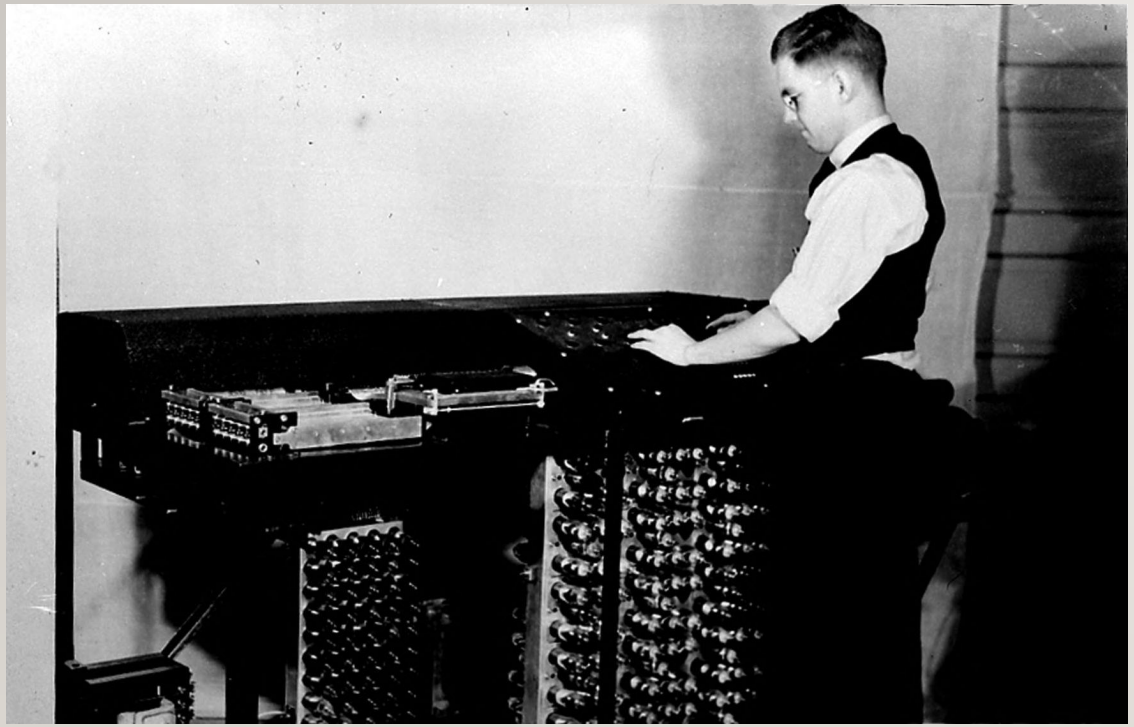
(1947?) Destruction of ABC

With the USA now directly involved in the war priorities changed. In 1942 Atanasoff left ISC for a wartime job at the Naval Ordnance Laboratory. Berry graduated and left for a job with a military supplier.

Large change over in staff and lack of foresight at ISC led to them never following through with patent application.



(1967-1973) Eniac Patent Case



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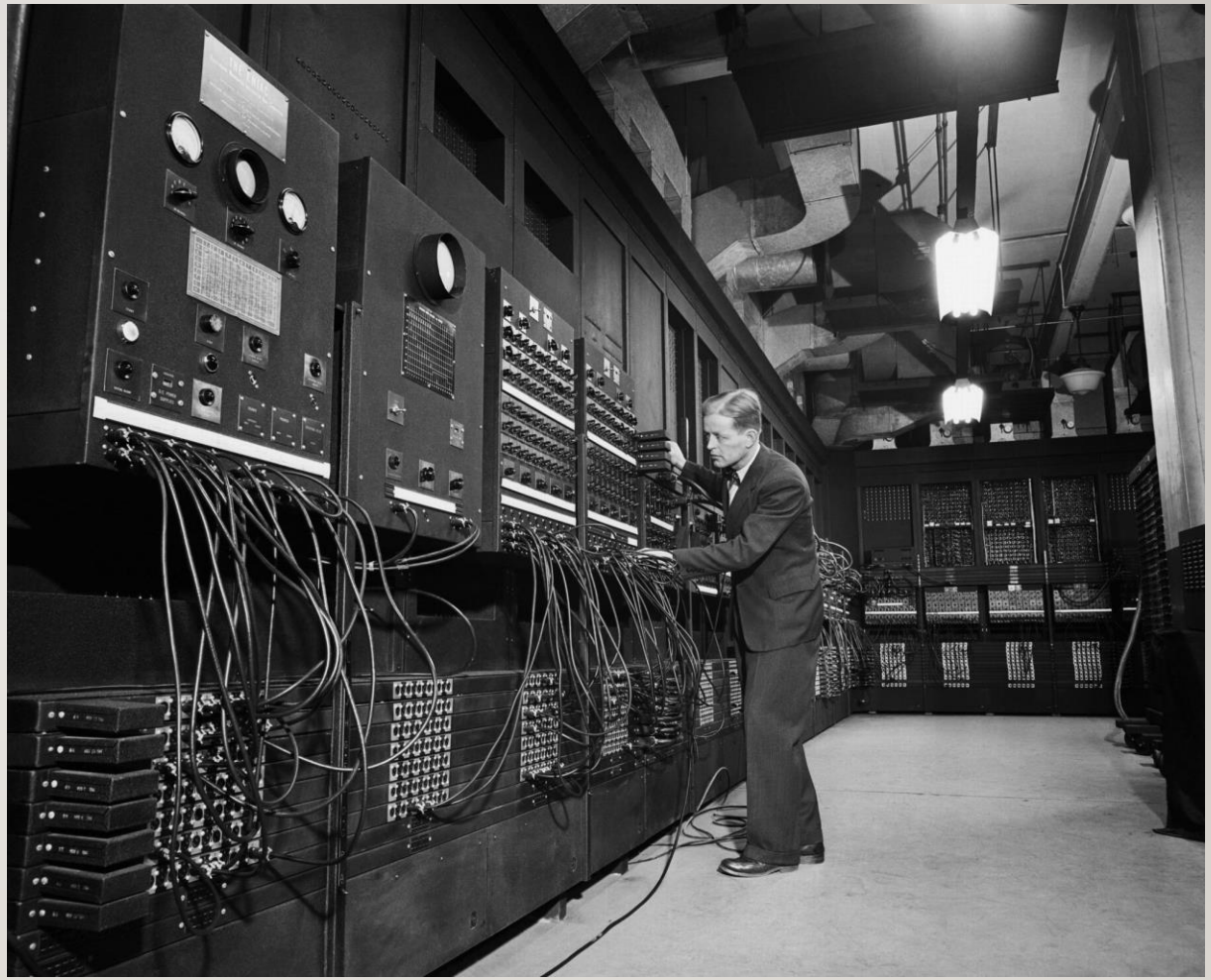
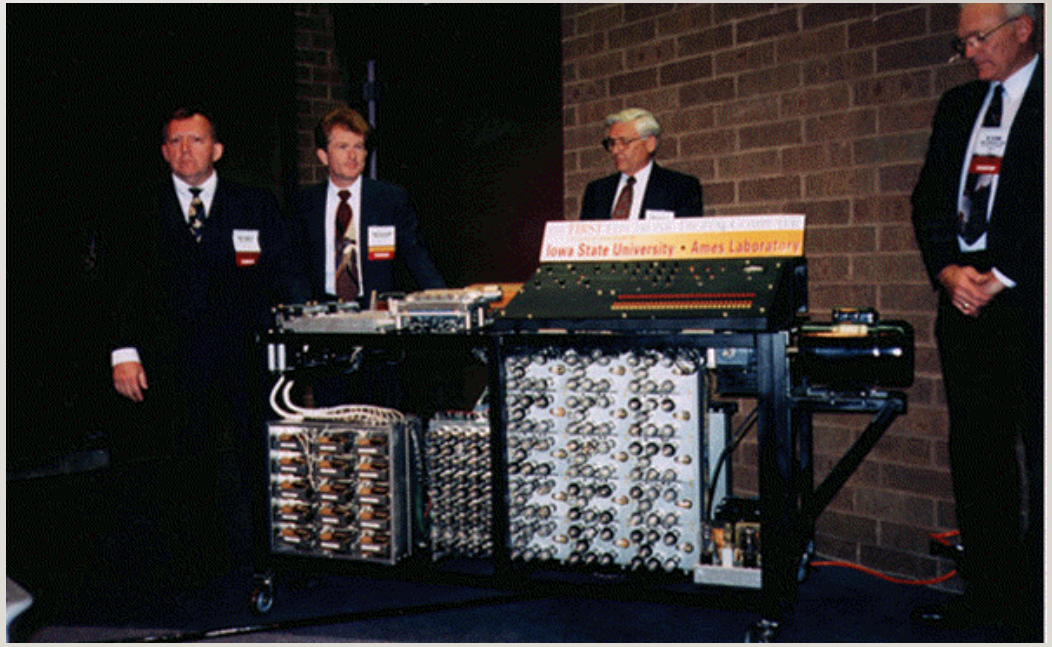


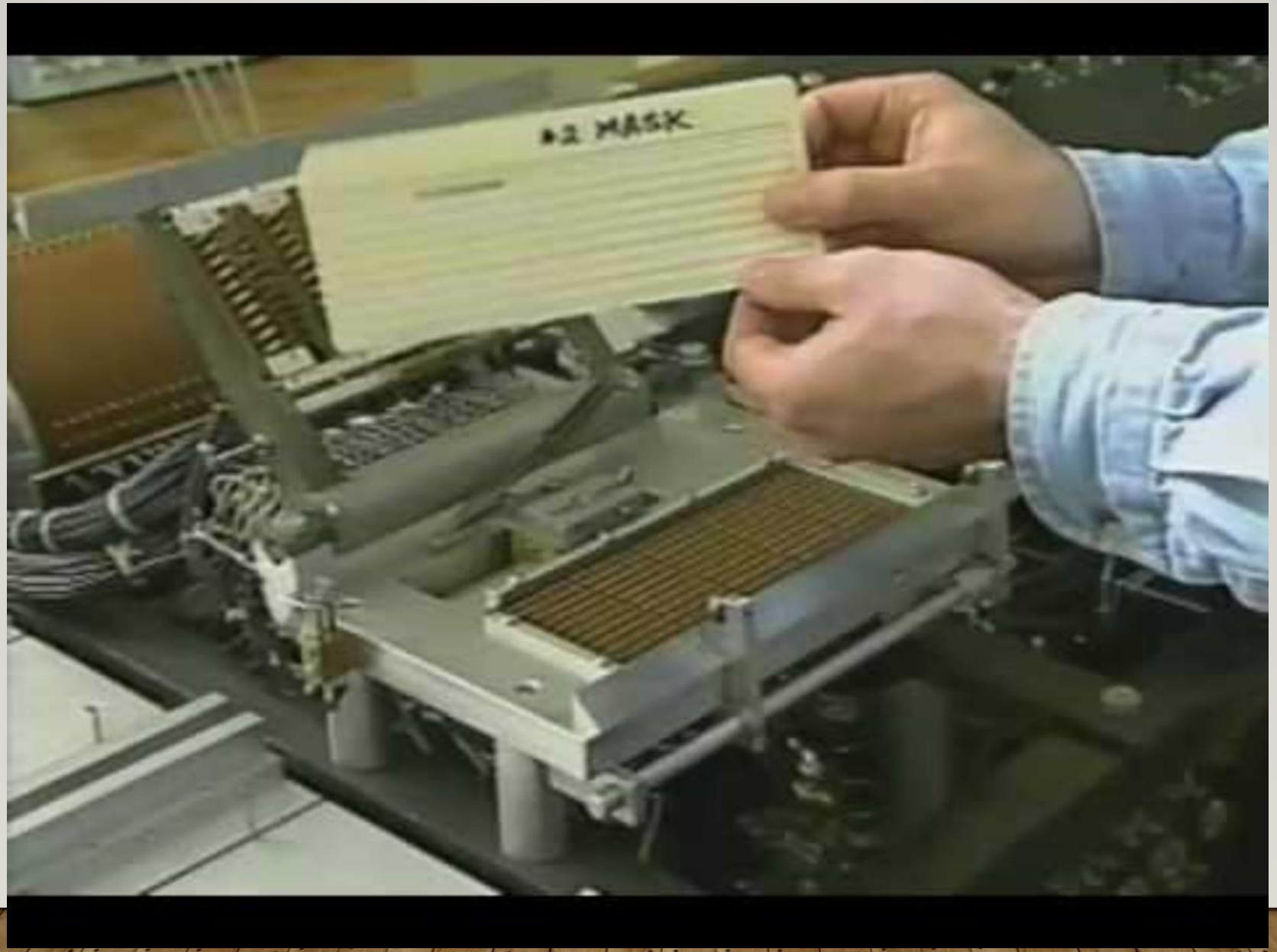
(1994-1997) Reconstruction of ABC

Between 1994 and 1997 George Strawn and Del Blum championed the idea of reconstructing the ABC from period materials.

The original ABC cost $6,000 to construct in 1940. In 1994 the price tag of the reconstruction was $300,000.

$6,000 in 1940 ~= $64,000 in 1994




#2 MASK

Bibliography

Atanasoff Forgotten Father Computer, Clark R. Mollenhoff
ISBN 0-8138-0032-3
Good general mix of biography, technology and court case

The First Electronic Computer, Alice & Arthur Burks
ISBN 0-472-10090-4
Husband & wife team who both worked on Eniac project. Very in depth in both the technology and court case.

The Man Who Invented the Computer, Jane Smiley
ISBN 978-0-385-52713-2
Biography of JVA plus a very goof comparison and contrast to other early computers of the era.