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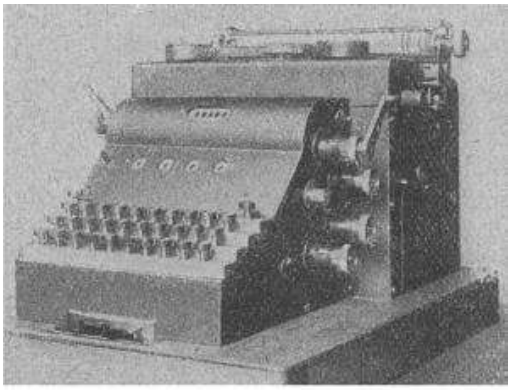
Enigma A

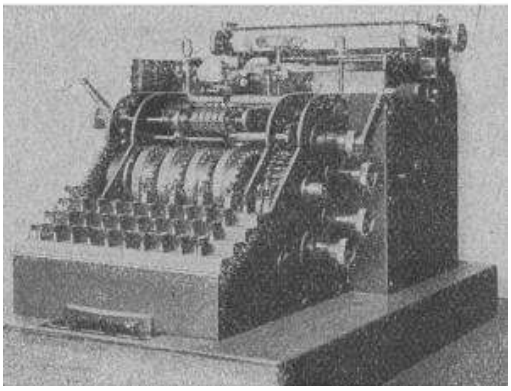
Printing Enigma machine

The Enigma A is the very first cipher machine sold under the Enigma brand. It was developed by the company *Scherbius & Ritter* of Berlin-Wannsee (Germany), but was taken 4into production by *Gewerkschaft Securitas* (later: Chiffriermaschinen AG), also of Berlin. As far as we currently know, there are no surviving examples of the Enigma A. The machine was succeeded by the Enigma B.

Enigma A was a very heavy and bulky machine that could write its output directly onto paper. It is therefore sometimes called a *Schreibende Enigma* (Printing Enigma). The description below was taken from an article by the inventor Arthur Scherbius in a technical magazine in 1923 [1].



The machine featured 4 coding wheels with 28 electrical contact points each, and a cog-wheel driven transport mechanism. Each cog-wheel had a different number of teeth (using prime numbers and numbers without a common factor) in order to guarantee a long cipher period and irregular (i.e. less predictable) stepping [2].



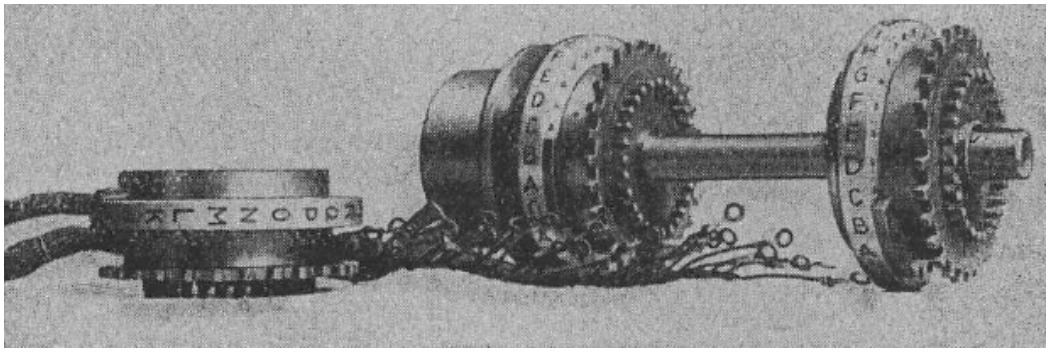
The four cipher wheels were fitted permanently inside the machine and their starting position could be set with four knobs at the right. By pulling out each knob, the position of the driving (notched) cog-wheel could be also altered. A fifth knob at the top was connected to the main transport axle. By inserting a crank into this knob, the entire ciphering mechanism could be moved forward and backward, which was intended for the correction of mistakes.

Above the cipher wheels was a 5-digit counter (German: Zählwerk) that counted the number of characters entered on the keyboard. The counter was reset with a handle sticking out in the left.

As the ciphering operation was not reciproke (i.e. reversible), a handle was present at the front of the machine to select between **ciphering**, **deciphering** and **plain text**. When switching between ciphering and deciphering, the electric current through the cipher wheels is reversed, which also reverses the algorithm. When set to **plain text**, the machine can be used as a common typewriter.

At the top/rear of the machine is the actual printer that resembles the printing part of a standard typewriter of the era. It consists of a paper carriage and a wheel printer. The characters would be printed in groups of 5 letters and a space would be inserted automatically between the groups when creating cipher text. 10 such groups fitted on a single line (50 characters), after which the user manually had to return the carriage to the start of a new line. When deciphering, spaces would be inserted automatically where appropriate, so that the text was immediately legible.

The keyboard consists of numbers and letters, and a spacebar. A *plain text* message may consist of a mixture of these elements, whilst the two **Shift**-keys are used to toggle between letters and figures. The *cipher text* only contained text however, as the cipher wheels only have 28 contacts each. In morse code, letters are typically shorter than numbers, resulting in shorter messages [1].



The Enigma A featured a complex cog-wheel driven wheel turnover mechanism with irregular stepping.

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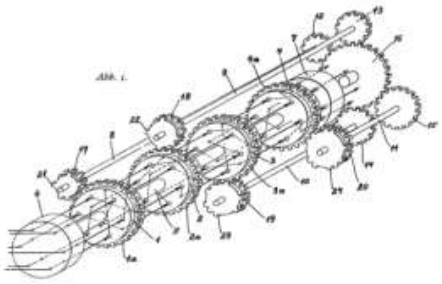
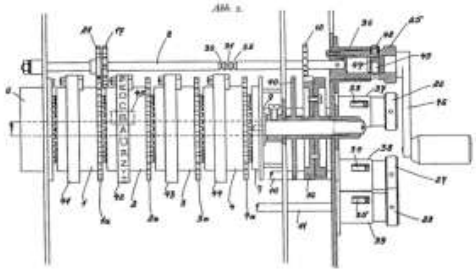
Each cipher wheel had a large cog-wheel attached to its right side, driven by a set of smaller cog-wheels (each with a different diameter) from which a number of teeth were missing.

According to Scherbius, it had a cipher period of approx. 1 million, which means that the cipher pattern repeats only after 1 million characters. About 20,000 of such periods were present. Part of the wheel turnover mechanism is described in patent DE429122 of 26 March 1924 [2].





At this time we don't have access to better images of the Enigma A. The pictures shown on this page were taken from a detailed description of the machine by **Arthur Scherbius** himself in *Elektrotechnische Zeitschrift* (Electro-technical Magazine) in 1923. In 2008 we found this magazine at an antiques shop in Germany. The full article can be downloaded below.

Newer models and improvements

The Enigma A was developed and introduced in 1923. Due to reliability problems with the print wheel mechanism, it was soon replaced by the Enigma B that featured commonly used type bars (German: Typenhebel). After several improvements, the Enigma B was replaced in 1929 by the Enigma H which is also known as the Enigma II. It uses shift-bars instead of normal type-bars.

A year after the introduction of the Enigma A, the company also released the first *Glühlampen-maschine* (lamp machine), the Enigma C, with was much smaller, far less heavy and above all much cheaper. Although the lamp-based machine was technically far less advanced than the printing variants, it was far more successful and eventually evolved into the Enigma I that became the mainstream cipher machine of the German Army during WWII.

Confusing names

Please note that the name **Enigma A** sometimes leads to confusion. As the early lamp-based Enigma machines C, D, G, K and I (Wehrmacht) initially all had serial numbers starting with the letter 'A', these machines are sometimes (wrongly) called *Enigma A*. Even during WWII, the **Enigma I** machines used by the *Wehrmacht* and *Luftwaffe* sometimes had serial numbers starting with the letter 'A'. The name **Enigma A** should only be used for the first typewriter-style Enigma models described on this page.

Help required

At this time, no further information about the Enigma A is available to us. It is likely that only a few were ever built. As far as we know, there are no surviving examples of this machine. If you have additional information about this machine, please contact us.

References

1. Dr.-Ing. Arthur Scherbius. *Enigma Chiffriermaschine*
Elektrotechnische Zeitschrift. 1923. Heft 47/48. p. 1035-1036.

2. Paul Bernstein, *German Patent DE429122*
Chiffriermaschinen Aktiengesellschaft. 26 March 1924.

Further information

- Enigma B, the successor to the Enigma A
- Enigma Family Tree
- Other Enigma models

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