

THE DUTCH INVENTION OF THE ROTOR MACHINE, 1915-1923

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ABSTRACT: The rotor machine was invented in 1915 by two Dutch navy officers, R. P. C. Spengler and Th. van Hengel, who were working at the Navy Department in the Dutch East Indies. A prototype was built by W. K. Maurits, a mechanical engineer, and tested during the summer of that year on board the flagship of the Dutch Navy in the East Indies on order of the fleet commander Rear Admiral F. Bauduin. Though the Dutch Navy decided not to adopt the device for it prevented the invention from being patented by the original inventors. The Navy could not prevent the rotor machine from being patented, however, by Hugo Alexander Koch—an engineer and businessman working in close collaboration with Arthur Scherbius in Germany—who probably became familiar with the idea through his brother-in-law, Huybrecht Verhagen, a patent attorney working at the firm that had supported the abortive patent application by the original inventors.

KEYWORDS: Rotor machine, Dutch navy, H. A. Koch, World War I, Enigma Model A, Th. A. van Hengel, R. P. C. Spengler, German industrial espionage, Treaty of Versailles.

INTRODUCTION

The rotor machine, one of the most important innovations in the history of cryptology, was independently invented by four people at roughly the same time: Edward Hugh Hebern in the United States in 1917 became the first to file for a patent. Arthur Scherbius in Germany came in second with a patent application, dated 23 February 1918. Arvid Gerhard Damm more or less shared a third place with Hugo Alexander Koch, with patent applications in Sweden and the Netherlands during the second week of October 1919. These first machines may have differed in detail, but all had the rotor in common. To cite David Kahn (with excisions):

The body of a rotor consists of a thick disk of insulating material. Embedded around the circumference of each face are 26 evenly spaced electrical contacts, often of brass. Each contact is connected at random

by a wire to the opposite face. Thus a path for an electrical current is set up that starts at one side and ends on the other.

The contacts on the starting, input face represent the plaintext letters, those on the output face ciphertext letters. The wire connections between the two provide a way of converting plaintext letters to ciphertext. To carry out this manipulation, the rotor is placed between two fixed plates, each also of insulating material and with 26 contacts studied in a circle, to match those on each face of the rotor. Each contact on the input plate is connected to a typewriter key that represents a plaintext letter.

The use of one rotor only, will produce a progressive-key polyalphabetic substitution with a mixed alphabet and a period of 26. If a second rotor is added, shifting one space after the first rotor has completed its revolution, this periodicity will augment to $26 \times 26 = 676$ and so on.¹

That the rotor machine was invented more or less simultaneously by four different people may seem odd, but the history of science and technology has seen similar things happen. The invention of the aeroplane both in France and the United States at the beginning of the 20th century is a case in point; the debate about who takes precedence in the development of the public key system—Diffie, Hellman, and Merkle or James Ellis at GCHQ is another.²

It is more difficult to explain, however, that this revolutionary device was invented by civilians and launched by private enterprise for business purposes—all within months after the end of the First World War. This is already a clear break with the past. Before the war, the principal authorities, with the notable exception of Kerckhoffs,³ had all been army men, not civil engineers. Kasiski⁴ had been a major in the Prussian army; Fleissner von Wostrowitz⁵ had held rank in the Austrian army, and Bazeries⁶ in the French army. Even Kerckhoffs had applied for a chair at the École Militaire in Saint-Cyr. Generally speaking, the war had greatly strained existing encryption methods and devices: they had

¹David Kahn, *The Codebreakers. The Story of Secret Writing* (New York: Macmillan Publishing Company, 1967), 410-412.

²Simon Singh, *The Codebook. The Science of Secrecy from Ancient Egypt to Quantum Cryptography* (London: Fourth Estate, 1999), 268-292.

³Kahn, *Codebreakers*, 230-238

⁴Kahn, *Codebreakers*, 208-209.

⁵E. B. Fleissner von Wostrowitz *Handbuch der Kryptographie* (Wien, 1881).

⁶Kahn, *Codebreakers*, 240.

been stretched to their limit⁷; should this not have stimulated the invention of the rotor machine?

It is true that in Germany the rotor machine was intended initially for military purposes. After filing for a patent, Arthur Scherbius offered his invention first to the Kriegsmarine. The idea of promoting the Enigma as a business machine came only after the war had ended and it was not much of a commercial success.⁸ But this does not explain why this development took place outside the military. A possible explanation might be that the invention of the rotor machine was a by-product of a more or less autonomous development in engineering. During the previous century mathematics had been of little practical value to engineering in the sense that it was unable to take everything into account and to predict what would actually happen. This caused for much dismay. During the last decade of the 19th century German engineering had even witnessed the rise of a so-called 'anti-mathematical movement', wanting to sever the ties between mathematics and engineering; this was only gradually overcome after the turn of the century by mathematicians who took an active interest in engineering, such as Felix Klein and Richard von Mises, publisher of the *Zeitschrift für Angewandte Mathematik und Mechanik* (1921) and co-founder of the *Gesellschaft für Angewandte Mathematik und Mechanik* (1922).⁹ Perhaps some engineers with a newly won interest in mathematics became interested in the arithmetic of cryptology too—and they were the ones to build machines!

An investigation into the nature of the link between the military and engineering in all four countries will probably provide the answer. In this article I shall deal with the Netherlands, a particularly rewarding topic, because the rotor machine was first invented there in 1915 and adopted for the remaining part of the war by the Dutch navy on an experimental basis.

I shall deal with the following items: first the difficult geopolitical situation of the Netherlands and particularly the Dutch East Indies during the First World War, in particular with reference to the operational consequences for the Dutch navy and the building of the first prototype of the rotor machine in the East Indies; second, the attitude of the naval authorities after the war; third, the fight over the patent between the original inventors and Koch and Scherbius.

⁷Kahn, *Codebreakers*, 383-384.

⁸David Kahn, *Seizing the Enigma. The Race to break the German U-Boat Codes, 1939-1943* (Boston: Houghton Mifflin Company, 1991), 31-38.

⁹S. Hensel, K-N. Ihmig, N. Otte *Mathematik und Technik im 19. Jahrhundert in Deutschland: Soziale Auseinandersetzung und philosophische Problematik* (Göttingen: Vandenhoeck und Ruprecht, 1989), 83-101.

THE INVENTION OF THE ROTOR MACHINE IN THE EAST INDIES

In the summer of 1914, the Netherlands had not participated in any war other than colonial for a century and it had the declared intent to stay neutral. The country was nonetheless heavily affected by the outbreak of hostilities because of its geography. Bordering in the east on Germany, in the south on Belgium and in the west separated from England only by the North Sea, it was permanently suspected by both sides of collaborating with the enemy, particularly through shipment of supplies. The Dutch tried to fend off accusations by meticulously safeguarding their neutrality. Belligerent warships entering territorial waters were chased; the borders with Germany and Belgium were closely watched in order to prevent smuggling of persons or goods; all exports and imports were closely monitored.¹⁰

In the Dutch East Indies, consisting of a great many islands, dispersed over a vast area half a world away, these tasks were more difficult to perform than in the motherland. The colonial army was present only on the most important islands in the centre of the archipelago, such as Java and Sumatra; the outlying districts had to be guarded by the navy.¹¹ This was a hazardous undertaking. The navy squadron in the Dutch Indies consisted of only 10 ships, most of which were in a poor condition and did not stand any chance in battle when acting on their own¹² and the danger was very real. The Dutch Indies could be reached by dozens of warships from the belligerents and the United States within a matter of days. To make things worse, the Germans had placed a number of fuel stations in the outer part of the archipelago—without the consent or even the knowledge of the Dutch authorities. This was a clear violation of Dutch neutrality and it provoked activity of British, French and Japanese war ships in the area as well.¹³ The Dutch squadron was supposed to act against any violation, but it could hardly afford to engage in battle and it was not always clear how to react under different circumstances. The Dutch government, for instance, considered the Straits of Makassar and Karimata—with widths exceeding 50 sea miles—to be territorial waters. None of the belligerents accepted this claim. To prevent the

¹⁰Marc Frey, *Der Erste Weltkrieg und die Niederlande. Ein neutrales Land im politischen und wirtschaftlichen Kalkül der Kriegsgegner* (Berlin: Akademie Verlag, 1998), 79, 111-112, 364.

¹¹Bob de Graaff, *'Kalm temidden van woedende golven': het ministerie van Koloniën en zijn taakomgeving, 1912-1940* (Den Haag: Sdu Uitgevers, 1997), 420-421.

¹²F. Bauduin, *Het Nederlandsch Eskader in Oost-Indië, 1914-1916* ('s-Gravenhage: Martinus Nijhoff, 1920), 11-15.

¹³*Ibid.* 40, 47; G. Teitler, 'De Staf der Zeemacht in de Oost, 1902-1949' in: L. Brouwer *et al.*, *Tussen Vloot en Politiek. Een eeuw Marinestaf, 1886-1986* (Amsterdam/Dieren: De Bataafsche Leeuw, 1986), 58.

squadron from starting a war by obeying orders too strictly, its commander—Rear Admiral F. Bauduin—was forbidden to act without permission from the commander of the navy in Batavia, F. Pinke.¹⁴

Needless to say, this put a great strain on communication security. Bauduin's squadron had to rely mostly on the wireless; it rarely reached a port where it had a telegraph at its disposal. And even the use of radio had its limits. In certain mountainous areas, ships had to leave port to contact Batavia.¹⁵ The reliance on radio was also a matter of concern for another reason. Bauduin's squadron had been intercepting the radio signals of third parties regularly.¹⁶ In 1914, the navy had code and signal books, but they were intended for administrative or tactical use, and communication security was considered to be of only secondary importance. The navy code book received a secret appendix only in December 1914 and the signal book was provided with a secret counterpart in May 1915.¹⁷ Regrettably, neither book met the requirements of the Dutch squadron in the East. The exchange of strategical considerations or political assessments clearly was not envisaged.

On 12 January 1915 Bauduin issued a memo to his officers about the withdrawal of German warships from the archipelago during the preceding month and summing up the requirements for the future. Mentioning a number of violations of Dutch neutrality by the British and the Japanese, he made it clear that he believed that the danger was not over. He also emphasized that he expected the war to last for a long time and that the Germans could come back any time.¹⁸ He did not mention that a cipher machine was being devised in order to improve communication security.

This job was assigned to two first sea lieutenants, posted at the Navy Department in Batavia: Theo A. van Hengel (27 October 1875 - 25 January 1939) and R. P. C. Spengler (14 January 1875-10 March 1955).¹⁹ The men had known each other for a long time and had been following more or less the same career path. They attended the Navy Academy in Willemsoord together and both had

¹⁴G. Teitler, 'Het ontslag van Vice Admiraal F. Pinke, Commandant Zeemacht in Nederlandsch-Indië, in de zomer van 1916', *Tijdschrift voor Zeegechiedenis*, 6 (1987), 28-32.

¹⁵Bauduin, 19, 37, 49.

¹⁶*Ibid.*, 43, 76, 83.

¹⁷Chief of Staff of the Navy to the Minister, September 1922: The Hague, Algemeen Rijksarchief, Marinestaf, inv. nr. 306.

¹⁸Bauduin, 157-162.

¹⁹The section below covering the careers of Spengler and Van Hengel is based on their service records: The Hague, Algemeen Rijksarchief, stamboek marineofficieren na 1850, inv. nr. D 1: records 1173 and 1175; both men are also mentioned in: *Gedenboek uitegeven ter gelegenheid van het 75-jarig van de Opleiding tot Zeeofficier aan het Koninklijk Instituut voor de Marine te Willemsoord, 1854-1929* (s. l. 1929), 175-176.

graduated on 2 August 1895. They both had been on active duty during the Atjeh war, policing the waters off Sumatra: Van Hengel during 1896-1900 and Spengler during 1898-1900. From 1 November 1897 until 8 February they served together on the guard ship *Gedeh*.

Both men showed a strong interest in the designing and manufacturing of torpedoes. For two years, Spengler had been supervising the manufacturing of torpedoes ordered by the Dutch navy in Fiume on the Adriatic coast, before assuming command of the torpedo workshop at the navy shipyard in Hellevoetsluis. Van Hengel had volunteered for the torpedo service in 1909 and was appointed deputy director of the torpedo workshop in Willemsoord on 2 October 1911. It seems likely that during this time he stayed in touch with his old classmate Spengler who occupied the same post in Hellevoetsluis.

This field of interest placed them in the forefront of technical innovation. The torpedo was a new weapon whose enormous potential had been revealed only during the Russo-Japanese War of 1904 to 1906. Russian battleships with enormous firepower had been shown to be virtually defenseless against the much smaller, faster, and cheaper Japanese submarines. The Japanese victory at sea caused much concern to the Dutch navy. In 1906 an official analysis of the war showed how vulnerable conventional battleships had become. It also pointed out that submarines and torpedo boats provided a new and better way of defending the main islands of the archipelago, in case of an invasion to capture the Dutch East Indies.²⁰

Improving the torpedo required an understanding of both aero- and hydrodynamics. This kind of research involved a much more sophisticated use of applied mathematics than had been required 30 years before, when the focus in engineering had been on the building of bridges.²¹ It also required an extensive use of probability calculus. There is little doubt that Spengler, and perhaps Van Hengel too, personally had played an active role in the experiments to improve the performance of the torpedo.²² Dutch navy officers who felt the inclination were encouraged to do scientific research and they were even allowed to reap some of its benefits themselves.

In 1913, both men met once again, at the Navy Department in Batavia. Van Hengel had been working there from 21 April 1912; Spengler arrived on 13

²⁰J. M. Mohrmann, *Marine-torpedodienst, 1875-2000* (Amsterdam: De Bataafsche Leeuw, 2000) 25-26, 168; G. Teitler, *Anatomie van de Indische Defensie* (Dissertatie Leiden, 1988), 245-287.

²¹Gerard Alberts, *Jaren van berekening. Toepassingsgerichte initiatieven in de Nederlandse wiskundebeoefening, 1945-1960* (Amsterdam: University Press, 1998), 301-306.

²²On 11 March 1921, Spengler received under number 5863 a patent for a mechanism, aimed at making exercise torpedoes float again after being fired. See: A. E. Jurriaanse to R. P. C. Spengler, 1921, April 4: The Hague, Instituut voor Maritieme Historie, collectie torpedodienst, inv. nr 580 (file on Spengler).

October 1913.

In the early months of 1915 Spengler and Van Hengel started working on their cipher machine. Unfortunately, nothing is on record about the initial stage of the project, but it seems likely that they were asked to think of something by Pinke, who was struggling to find safe ways of communicating with squadron commander Bauduin. They probably were picked because of their engineering skills. That they should come up with a device that was to change the standards of cryptology for a long time to come cannot fully be explained. It seems plausible, however, that they were aiming at designing a machine mathematically more sophisticated than any previously existing device.

The prototype was ready a few months later and in the middle of 1915 a second copy was manufactured on the *De Zeven Provincieën*, Bauduin's flagship, by Sea Lieutenant W. K. Maurits, a mechanical engineer and operator of the wireless,²³ following instructions by Spengler and Van Hengel. Maurits did not specify whether either of them were on board, but he was adamant that he had built a rotor machine. In a letter supporting the patent request of his colleagues he wrote:

This patent request coincides in every single detail with the machine I built myself in 1915 on behalf of the inventors.²⁴

Unfortunately, neither machine nor drawings have been saved, but it seems likely that it resembled the first Enigma, called model A in the book by Deavours and Kruh²⁵: the model to be demonstrated in 1923 at the International Postal Congress in Bern. This cannot be proved, but it is more than mere speculation. Spengler and Van Hengel opposed Koch's patent for his rotor machine by claiming that his drawings were identical with theirs.²⁶ If combined with Deavours' and Kruh's observation that the first models of the Enigma closely followed the drawings in the original patents, one can hardly reach a different conclusion.

The greatest differences with later models was that the rotors were moved through two sets of geared wheels, mounted on driving axles, and that the machine had still something in common with a ordinary typewriter. As described by Deavours and Kruh:

The machine is quite heavy and bulky, bearing a standard typewriter

²³Bauduin, 40.

²⁴W. K. Maurits to the Patent Council, Vlissingen, 1920, September 1: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

²⁵Cipher A. Deavours and Louis Kruh, *Machine Cryptography and Modern Cryptanalysis*(Dedham, Mass. : Artech House 1985).

²⁶See below.

keyboard for input. It consisted of four rotors which were driven by four geared wheels. The four drive wheels each drove one rotor and were gapped in their number of teeth (...). The rotor movement was quite irregular looking because rotors paused whenever they encountered a gapped sector of their drive wheel(...)²⁷

A short mention of the invention in both Van Hengel's and Spengler's service records matches this description. On 30 March 1919, both men were officially thanked by the Minister of the Navy for devising a 'ciphering typewriter with codewheels'.²⁸

Needless to say, the rotor machine met all requirements of navy cryptography. The machine was both rapid and reliable, and it was less prone to human error than any hand-operated system ever could hope to become. Last but not least, it was capable of generating ciphers of an unprecedented strength.

THE NAVY DEPARTMENT IN THE HAGUE

Spengler was sent back to Holland on 23 August 1916; Van Hengel on 21 December. In 1917, they both were engaged in training of torpedo personnel: Van Hengel on the *Emma*; Spengler on the *Schorpioen*. On 21 August 1919 Spengler was put in charge of a guard ship in Flushing on his own request because his little daughter, born in 1911, was seriously ill and had to be taken into medical care. In the meanwhile, Van Hengel was put in command of the *Medusa*, a minelayer.

It seems likely that the two prototypes stayed behind in the Dutch Indies, rendering service until the armistice of 11 November 1918 between Germany and the Entente and perhaps longer. It seems likely too that the prototypes were shipped to Holland on the *De Zeven Provincieën*, when it returned to the motherland shortly after the end of hostilities. The machines were returned to the inventors.

In March 1919, Spengler and Van Hengel sent one of their prototypes and a copy of the drawings to the Navy Department in The Hague. The war was over now and the minister had to decide what to do with it. Until then the Navy Department in The Hague had played no role of any significance in the experiments with the rotor machine. The navy squadron in the Dutch East Indies operated under the responsibility of the governor-general and, indirectly, of the Colonial Office. Personnel was not allowed to keep in touch with the navy

²⁷Deavours and Kruh, 94.

²⁸The section below covering the careers of Spengler and Van Hengel is based on their service records: The Hague, Algemeen Rijksarchief, stamboek marineofficieren na 1850, inv. nr. D 1: records 1173 and 1175.

officials in The Hague. All communications had to be channeled through the Colonial Office.²⁹

The inventors wanted to know what the navy's intentions were. If it were not interested, they wanted permission to file for a patent. Under that condition, they considered the machine to be theirs to dispose of.³⁰

What happened next is not easy to tell, because almost all documents related to this matter were destroyed during an accidental British bombing of the Bezuidenhout on 5 March 1945. All we have left are a few summaries in the department's register of incoming and outgoing letters.³¹ The topic was not new. During World War I, the Navy Department had had numerous dealings with codes and ciphers and it had become increasingly aware of the insufficiency of its current standards. To cite but a few examples: The 'navy codebook' had to be revised and enlarged on several occasions, receiving a 'secret appendix' in December 1914. The 'signal book' (with manual) had to be supplemented by a 'secret Signalbook' in May 1915 (changed in March 1919). Other codebooks were the 'cutter signalbook', the 'codebook for the coast guard', established in May 1917, a so-called 'ship maneuver book', a 'call sign code', a 'location code', introduced in December 1910, to be replaced in 1922 after numerous experiments by the 'sea chart code' or so-called 'chequernet', and, last but not least, an 'air reconnaissance signal book' for the Dutch Indies. More often than not, these code and sign books were to be used only in combination with some form of superencipherment.³²

The rotor machine had tremendous advantages—so much must have been clear to anyone familiar with the restless experimenting in this area that had been going on during the war and after. But the invention came at a bad moment because large expenditure cuts had been envisaged after the end of the war. The Navy Department took more or less for granted that the machine was too expensive for the navy to build in some quantity, but the tables might be turned, if the army would share the costs. On 12 July 1919, the prototype was sent for a demonstration to the Dutch Black Chamber.

This Black Chamber, more or less a one-man show of a lieutenant of the Dutch Colonial Army, Henri Koot, dealing with matters of censorship at General Headquarters, was a relatively new phenomenon. It had been put in place on 1

²⁹De Graaff, 402-403.

³⁰Appeal to Patent Council by Th. van Hengel against the honouring of the patent-request by H. A. Koch, The Hague, 1922, October 14: Rijswijk, Bureau voor Industriël Eigendom, filenumber 13046.

³¹Agenda Marinestaf, entries dated 1919, March 20, July 12, August 29, September 13 and 23, October 18 and 28: The Hague, Algemeen Rijksarchief, Marinestaf, inv. nr. 46.

³²Chief of Staff of the Navy to the Minister, September 1922: The Hague, Algemeen Rijksarchief, Marinestaf, inv. nr. 306.

August 1914: only a few days after the outbreak of hostilities between Austria and Serbia and Germany and Russia and two days before the outbreak of war between Germany and France.³³

The appointment of Koot to this post was more or less a coincidence. Koot happened to be in the country when the war broke out: he had just completed a course at a military academy, necessary to achieve senior ranks, and he was about to go back to the Dutch Indies.³⁴ He was bright, uncommunicative and obedient. For an intelligence officer these were all assets, but this does not explain his skills as a codebreaker.³⁵ Initially, his knowledge about cryptology was based mainly on what had been written mostly by French and Austrian experts.³⁶ In the course of the war he was able –almost singlehanded—to break both German and British diplomatic traffic and one or more German U-boot codes.³⁷ On 1 May 1919, Koot's Black Chamber received permanent status. Koot's main task was no longer eavesdropping, but progressively the monitoring of the construction of codes and ciphers on behalf of the Dutch government in general, including the Department of Foreign Affairs and the navy. This task was given even greater weight on 1 April 1920, when Koot was appointed head of the so-called 'Cipher Bureau', a newly created interdepartmental body with the sole purpose of devising codes and ciphers.³⁸

Nothing is known about Koot's initial response to the navy's rotor machine, but statements he made later on show that he was a great enthusiast for it. In a report written in 1926, Koot makes clear that he believed Enigma traffic to be impenetrable, due, 'to the extraordinary length of the period of each key as well as of the enormous number of keys being possible'.³⁹ There is no evidence, however, that this enthusiasm was already present at this early stage, and the codes and ciphers devised by Koot himself during those years seem to suggest that he still had not lost his confidence in the more modest, conventional means, as was the case in the German Foreign Office, where the 'Blockverfahren' had

³³F. A. C. Kluiters, *De Nederlandse Inlichtingen- en Veiligheidsdiensten* ('s Gravenhage: Sdu Uitgeverij, 1993), 179-180, 192-193.

³⁴G. J. van Ojen jr. *Leven en Werken van Henri Koot, 1883-1959* ('s Gravenhage: Sectie Krijgsgeschiedenis Koninklijke Landmacht, 1978), 25-29.

³⁵For a concise biography, see: Karl de Leeuw, 'Henri Koot', in: *Biografisch Woordenboek van Nederland, V*, (Den Haag: Instituut voor Nederlandse Geschiedenis, 2001) 272-274.

³⁶A well-endowed collection of cryptologic literature is still present in the old library of the War Department, preserved at the Legermuseum in Delft.

³⁷a separate article about Koot is forthcoming.

³⁸Van Ojen, 42.

³⁹Ronald Clark, *The Man Who Broke Purple. The Life of Colonel William F. Friedman Who Deciphered the Japanese Code in World War II* (Boston Toronto: Little Brown and Company, 1977), 109.

been introduced.⁴⁰

The navy diary does not mention Koot's report, but he may have given it orally some weeks later. If he did, it could not have been negative, because seven weeks later, on 29 August 1919, the navy asked for a cost estimate.⁴¹ Unfortunately, the diaries of the Navy Department do not tell whether this estimate was ever received and, if so, when.

After the matter had been dragging on for almost half a year inventors were losing their patience. During one of the first days of September, they took the prototype to a patent attorney to have it examined and described in accordance with the requirements of the Patent Act of 1910.⁴² In the meantime, the Navy Department became increasingly occupied with the question of intellectual ownership. On 13 September, during what appears to be an informal meeting with an expert, he apparently told the department that the inventors were unlikely to succeed in getting their patent registered without the consent of the navy.⁴³ This seems to suggest that Navy Department somehow got wind of the inventors' visit to the patent attorney before they were told by the inventors themselves. This happened only five days later—on 18 September—when the inventors notified the Navy Department in writing that they would file for a patent on the 25th.⁴⁴ It seems likely therefore that the expert was somebody from the patent attorney's office contacted by the inventors: the *N. V. Vereenigde Octrooibureaux*, a law firm accustomed to doing business with the navy.⁴⁵

Navy minister H. Bijleveld (1885-1954)⁴⁶ reacted furiously. First and foremost, the navy opposed the machine being patented because this would make the device publicly known. The minister reminded the inventors solemnly that they were sworn to secrecy.⁴⁷ This argument was baffling, because the Patent

⁴⁰Michael van der Meulen, 'The Road to German Diplomatic Cipher—1919 to 1945', *Cryptologia*, 22 (1998), 141-154.

⁴¹Agenda Marinestaf 1919, August 29.

⁴²A. E. Jurriaanse to Spengler and Van Hengel, The Hague, 1920, September 16: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁴³Agenda Marinestaf 1919, September 13; unfortunately this entry does not tell who the expert was.

⁴⁴Spengler and Van Hengel to minister H. Bijleveld, 's Gravenhage, 1919, September 18: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁴⁵See below.

⁴⁶Bijleveld, a politically inexperienced member of the 1st Cabinet Ruys de Beerenbrouck on behalf of the Anti-Revolutionary Party, was in office from 17 April 1919 to 2 January 1920. He got himself into trouble in parliament because it wanted him to both cut expenditure *and* to enlarge the Dutch fleet squadron in the East at the same time. Needless to say, this task was impossible to fulfill. See: G. Puchinger, *Colijn en het Einde van de Coalitie: de Geschiedenis van de Kabinetsformaties 1918-1924* (Kampen: J. H. Kok N. V., 1969), I, 166-169.

⁴⁷Minister H. Bijleveld to Spengler and Van Hengel, 's Gravenhage, 1919, September 23: Rijswijk, Bureau

Act offered the possibility of keeping patents secret whenever the national interest was at stake and the minister, an experienced solicitor who was to act as chairman of the Patent Council later on from 1922 to 1925, must have been well aware of that.⁴⁸ Therefore this cannot have been a genuine motive. It seems more likely that this argument was mentioned to make absolutely sure that the inventors would not act on their own.

In the department's's diary of outgoing and incoming letters, however, a second and more convincing motive is mentioned. In the minister's view, ownership rested with the navy, not with the inventors who were invited to renounce their claims.⁴⁹ The inventors declined, but they decided to postpone their patent application until further notice. Apparently, the negotiations had reached a stalemate with neither party able to act without the consent of the other. On 18 October the Navy Department requested legal advice from the government attorney.⁵⁰

By 24 October Spengler and Van Hengel had become desperate. Once more, they urgently requested permission to file for a patent, because the machine had been exhibited to so many people by then—not only at the Navy Department, but also at the Department of War, which entailed even greater risk, they believed—that the invention was in danger of being stolen.⁵¹

On 28 October the Navy Department suddenly dropped the case and authorised Spengler and Van Hengel to go ahead. The department was no longer interested in buying the machine, because of 'an entirely new insight arisen over night'. This insight was utterly unrelated to the fact that by now too many people had become acquainted with the invention, the minister emphasized.⁵² Unfortunately, one can only guess what this 'new insight' was all about. It could not possibly have been the result of the cost estimate, requested on 29 August and now proving that the manufacturing of the machine in large quantities was much too expensive, because this would have been mentioned in the department's diary of incoming and outgoing letters. This also holds true for a possible response of the government attorney, which is not mentioned in the diary either. Nor does it seem possible that the minister found out about the rotor machine

voor Industriëel Eigendom, filenumber 13046.

⁴⁸J. Alingh Prins, G. H. E. Bergsma *et al.*, *Octrooiraad, 1912-1937: Gedenkboek uitgegeven ter gelegenheid van het vijf-en-twintig jarig bestaan* ('s-Gravenhage: Zuid-Hollandsche Uitgevers Maatschappij, 1937), 21-22, 42.

⁴⁹Agenda Marinestaf 1919, September 23.

⁵⁰Agenda Marinestaf 1919, October 18.

⁵¹Spengler and Van Hengel to the minister, Vlissingen, 1919, October 24: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁵²H. Bijleveld to Spengler and Van Hengel, 's Gravenhage, 28 October 1919: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

having been patented in Germany, Sweden or the United States, because none of these patents had as yet been published. The only remaining possibility seems to be that the minister found that the rotor machine had been already patented by somebody else three weeks before in the Netherlands and it seems likely that he heard about it from his informant at N. V. Vereenigde Octrooibureaux, the law firm that had been instrumental in handling both patent applications.



Figure 1. Th. A. van Hengel, *Kapitein ter Zee*.

Source: Instituut voor Maritieme Historie, The Hague.

THE FIGHT OVER THE PATENT

The patent attorney contacted by Spengler and van Hengel in the beginning of September, without the Navy's permission, was A. E. Jurriaanse. They deposited their machine and their drawings with the request to prepare a patent application that could be filed as soon as the navy had made up its mind. This was only a matter of time, because they seriously doubted the navy's intention of putting the machine ever into practice.⁵³ They also demonstrated how the machine

⁵³Vriesendorp & Gaade to the Patent Council, The Hague, 1922, October 14.

worked.⁵⁴ On 29 November 1919 Jurriaanse had finally finished his job and filed for patent on behalf of the navy officers. It was registered by the Patent Council under number 13461: Application for a Cipher Machine.⁵⁵

That Spengler and Van Hengel contacted Jurriaanse was not entirely fortuitous. Jurriaanse was a partner in N. V. Vereenigde Octrooibureaux, a law firm accustomed to doing business with the navy. The firm's director was H. Blaupot ten Cate, a known promoter of German business interests.⁵⁶ He also had ties with the German navy. On 14 September 1922, Blaupot became founding director of Inkavos, short for Ingenieurskantoor voor Scheepsbouw.⁵⁷ On paper, Blaupot was Inkavos's owner, but in reality this firm was controlled by the Krupp armaments firm. Krupp provided the money and the board of commissioners consisted solely of Krupp men.⁵⁸ The undeclared purpose of Inkavos was to continue the development of German submarines outside Germany. The Treaty of Versailles disarmed Germany and prohibited the manufacturing of weapons of any kind on a substantial scale. The Netherlands, however, were not under the treaty's obligation.⁵⁹ It is true, Inkavos was founded in 1922, but the transfer of German arms manufacturing and shipbuilding started immediately after the armistice and N. V. Vereenigde Octrooibureaux, already engaged in the handling of patent applications for the Dutch navy, was a good stepping stone for the Germans as well. Neither did this escape the attention of the Dutch navy authorities, but they did not object. German and the Dutch navy men had collaborated before the outbreak of the war and the German industry had been the chief supplier of the Dutch army and navy for years. The Dutch had no interest whatsoever in the prohibition of German arms production; it only endangered the delivery of spare parts to the Dutch armed forces.. Johannes Houwink ten Cate, *De Mannen van de Daad en Duitsland, 1919-1939* (Den Haag: Sdu Uitgevers, 1995), 82-85

Surprisingly, N. V. Vereenigde Octrooibureaux was also involved in the handling of another patent application for a rotor machine by an electrical engineer of roughly the same age as the inventors: Hugo Alexander Koch (born in Delft, 9 March 1870, died in Düsseldorf, Germany, 3 March 1928), filed his application on 9 October 1919, roughly one month after the Navy officers had demonstrated

⁵⁴J. Knoop Pathuis and A. E. Jurriaanse to R. P. C. Spengler and Th. van Hengel, The Hague, 1920, September 16: Rijswijk, Bureau voor Industriël Eigendom, filenumber 13046.

⁵⁵Vriesendorp & Gaade to the Patent Council, The Hague, 1922, October 14.

⁵⁶M. M. Schim van der Loeff to the Centrale Vermogens Opsporingsdienst, The Hague, 1947, December 1: The Hague, ARA, Nederlands Beheersinstituut, 1945-1967, inv. nr. 69314, filenumber 263.

⁵⁷The Hague, Kamer van Koophandel, inv. nr. 008585a-403.

⁵⁸Directeur Nederlands Beheers Instituut, A. Oosthoek, to the Minister of Justice, The Hague, 1948, February 2: The Hague, ARA, Nederlands Beheersinstituut 1945-1967, inv. nr. 69314, filenumber 263.

⁵⁹William Manchester, *The Arms of Krupp, 1587-1968* (London: Michael Joseph Ltd, 1969), 395.

their machine to Jurriaanse, but three weeks before the navy gave permission to the inventors to go ahead. Koch's application was prepared by Koch's brother-in-law Huybrecht Verhagen⁶⁰ and J. Knoop Pathuis.⁶¹ Koch's patent was designed to show that the rotor principle did not depend on an electromechanical machine to work. Of course, the question may be asked whether he really believed that the rotor machine would ever be built, based on any other power supply than electrical. It seems more likely that he wanted to patent the permutation principle of the rotor generally rather than any machine existing in reality.

The patent, listing Koch as the inventor, belonged to N. V. Ingenieursbureau Securitas, which was registered on 4 May 1922 in Amsterdam as in the business of manufacturing and trading cipher machines. The firm address was Heerengracht 401/403: two 17th century canalside houses facing each other on the opposite sides of an alley in the city centre. Koch owned a minority of eight shares, whereas a majority of twelve shares belonged to two relatives of German origin by the name of J. T. and H. R. Z. Zur Mühlen. Strangely, an obscure administrative office or voting trust by the name of Damaraland, located nearby on Prinsengracht 747, had the right to appoint the director and the board. The decision to make this arrangement was taken on 22 August 1922 in Berlin.⁶² Damaraland's director was Adolf Hermkes, also of German origin.⁶³

Initially, the patent application had been made on behalf of Koch personally and not to Securitas. The transfer of rights took place on 5 May 1922: one day after Dutch Securitas had been registered.⁶⁴ It is obvious that Securitas was founded to facilitate the exploitation of Koch's patent, but the official registration of the firm by royal decree should be treated as the outcome of a development, not as a beginning. It is more appropriate to say that Securitas took shape between October 1919 and August 1922 and that it went through successive stages, showing increasing German influence.

The role of Damaraland is particularly intriguing and seems to suggest that Securitas was simply a German subsidiary company in disguise. Johannes Houwink ten Cate, author of *De Mannen van de Daad en Duitsland, 1919-1939*, a book

⁶⁰Hugo Koch married Maartje D. Verhagen on 25 May 1906, the marriage being closed by proxy in Soerabaja and Amsterdam. Maartje was a sister to Huybrecht Verhagen (2 May 1884- 29 March 1965), patent attorney by profession: The Hague, Centraal Bureau voor de Genealogie: Verhagen family book.

⁶¹Knoop Pathuis to the Patent Council, The Hague, 1923, July 7: Rijswijk, Bureau voor Industriël Eigendom, filenumber 13046.

⁶²Articles of association of N. V. Ingenieursbureau Securitas: Rijksarchief Haarlem; Kamer van Koophandel Amsterdam, filenumber 191839.

⁶³Articles of association of N. V. Administratiekantoor Damaraland: Rijksarchief Haarlem; Kamer van Koophandel Amsterdam, filenumber 12096.

⁶⁴Extract from Register Patent Council, 1922, May 5, signed by Jurriaanse and Knoop Pathuis: Rijswijk, Bureau voor Industriël Eigendom, filenumber 13046.

dealing with the collaboration between Dutch and German business and industry, writes:

The connection between the German mother and the Dutch subsidiary was always disguised in the same manner: the establishment of a Dutch voting trust or administrative office, directed by lawyers or bankers acting on behalf of the real owners.⁶⁵

Naturally, the more interesting question is who the German owners were. The most likely candidate is Chiffriermaschinen Aktiengesellschaft in Berlin, the manufacturers of Arthur Scherbius' *Enigma*. As a matter of fact, Scherbius original firm was called Gewerkschaft Securitas and this name was very much alike the N. V. Ingenieursbureau Securitas, employing Koch.

There is no doubt that both companies closely collaborated, as is shown by a comparison of the patents filed by both firms. German patent 425,147, filed on 26 September 1920 on behalf of the Chiffriermaschinen Aktiengesellschaft, is almost a literal translation of Dutch patent 10,700, filed by Koch on 7 October 1919. This date proves that the link with Germany preceded the arrangement in August 1922, giving Damaraland a decisive vote on the board. Moreover, the Dutch patent had almost two more years before it was published on 15 June 1922. This in itself indicates that Scherbius or one of his business friends was present at the very beginning of the development eventually resulting in Dutch Securitas.

The other patents corroborate this statement. Dutch patent number 12,762 filed on 17 May 1922 was identical with German patent 378,238, filed on 24 May 1921 by Scherbius. Additionally, N. V. Ingenieursbureau Securitas possessed German patents: 383,594, filed on 12 February 1922; 400,795, filed on 18 August 1923 and 411,126, filed on the same day. This patent mentions Paul Bernstein as the inventor, an engineer on the payroll of Chiffriermaschinen Aktiengesellschaft. German patent 383,594 involved a method of dividing the plaintext into paragraphs of fixed length, in order to prevent a message from being entirely garbled because of an interruption of the power supply. German patent 400,795 involved a device for printing ciphertext and plaintext alternately line after line. German patent 411,126 provided a new way of arranging or rearranging the key setting of any number of machines. These were all minor modifications to the rotor machine or, to put it differently, these patents were only meaningful in combination with other ones belonging to Scherbius and his partners in Germany or those belonging to Koch in the Netherlands. The consequence was that it was no longer possible to tell whether the machine was either German or Dutch in

⁶⁵Houwink ten Cate, 77.

origin.⁶⁶ The machine could pass as either. This was a tremendous advantage, in the light of the Treaty of Versailles. The treaty did not mention cipher machines, but prohibited the manufacturing of ‘war material’ in Germany and it had created a control committee with full rights of inspection that could add any items to the list it saw fit.⁶⁷

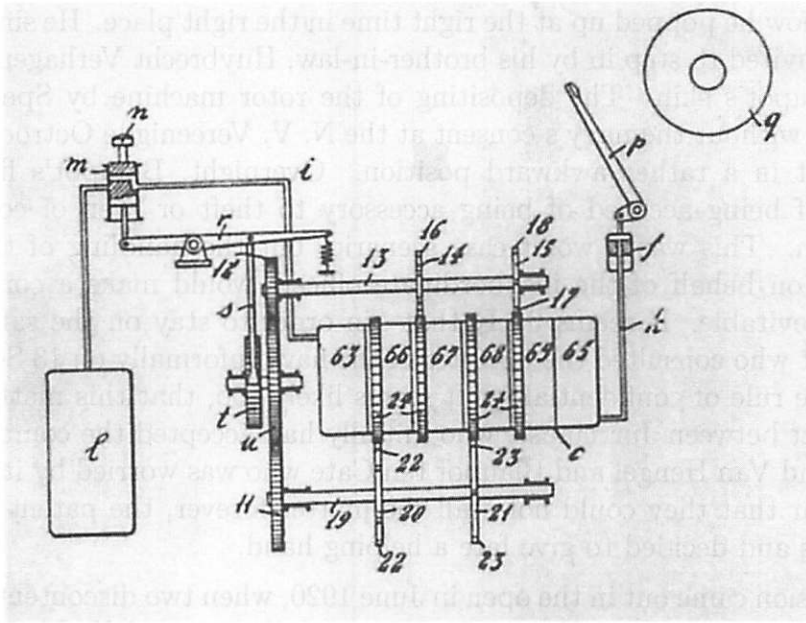


Figure 2. Details of Patent 10,700; Figure 8.

Source: Bureau voor Industrieel Eigendom, Rijswijk .

Therefore, it is likely that N. V. Ingenieursbureau Securitas was, or soon became, a Dutch front firm for Chiffriermaschinen Aktiengesellschaft in Berlin, founded with the sole purpose of transferring the production of rotor machines to Holland, whenever the continuation in Germany should prove difficult. It seems likely, too, that the director of N. V. Vereenigde Octrooibureaux, Herman Blaupot ten Cate, provided the connection between Koch and German business circles. Unfortunately, too little is known about the place of Chiffriermaschinen Aktiengesellschaft in German business. Was the company related to Krupp for instance? Was there a link with German navy? Both possibilities would account for the link with Blaupot ten Cate. More research is required on the German side.

⁶⁶For a similar use of patents in the United States by I. G. Farben see: Gabriel Kolko, ‘American business and Germany, 1930-1941’, *The Western Political Quarterly*, 15 (1962), 713-728.

⁶⁷*The Treaty of Versailles and After. Annotation of the Text of the Treaty*(Washington: United States Printing Office, 1947), 325-328 (Notes to articles 168 and 169).

The most difficult problem of all is the sudden appearance on the stage—so to speak out of the blue—of Koch, with another patent application for the rotor machine and also using Blaupot's law firm. Except for the possibility that Cryptology's Muse visited Koch in a dream, explaining to him the principle of the rotor and directing him to N. V. Vereenigde Octrooibureaux in order to prevent the navy officers from getting the patent first, there is only one way of explaining how he popped up at the right time in the right place. He simply must have been invited to step in by his brother-in-law, Huybrecht Verhagen, in order to save Blaupot's skin. The depositing of the rotor machine by Spengler and Van Hengel without the navy's consent at the N. V. Vereenigde Octrooibureaux, put Blaupot in a rather awkward position. Overnight, Blaupot's firm stood in danger of being accused of being accessory to theft or even of committing high treason. This was a worst case scenario, but the handling of the patent application on behalf of the insubordinate officers would make a conflict with the navy inevitable. It seems likely that—in order to stay on the safe side—it was Blaupot who consulted the minister of the navy informally on 13 September, breaking the rule of confidentiality. It seems likely too, that this matter caused some conflict between Jurriaanse, who initially had accepted the commission by Spengler, and Van Hengel and Blaupot ten Cate who was worried by it. When it became clear that they could not stall the matter forever, the patent attorneys closed ranks and decided to give fate a helping hand.

The collision came out in the open in June 1920, when two discontented patent attorneys—Jurriaanse and Knoop Pathuys—pulled out of N. V. Vereenigde Octrooibureaux, starting a business of their own.⁶⁸ Their first and foremost complaint was that the N. V. Vereenigde Octrooibureaux had been unable to keep its files in good order and, for that matter, under lock and key. In order to make a partition of the estate feasible, all files had to be reexamined and rearranged. In September 1920 Spengler and Van Hengel were notified at last that their case had been mishandled. Jurriaanse and Knoop Pathuys denied all responsibility, blaming everything on their colleagues that stayed behind. They did emphasize, however, that no foul play had been at stake. Jurriaanse working on behalf of the navy officers and Verhage together with Knoop Pathuys on behalf of Koch, had simply no way of knowing that they were dealing with colliding claims until it was too late.⁶⁹ It should be noted that this was a blatant lie, because both men had been personally responsible for submitting Koch's application to the

⁶⁸Knoop Pathuis to the Patent Council, 1923, July 7: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁶⁹Jurriaanse and Knoop Pathuis to Spengler and Van Hengel, the Hague, 1920, September 16: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

Patent Council on 7 October 1919.⁷⁰ If the inventors had known, they could have filed a complaint about Jurriaanse with the Patent Council, but they had nothing to lay a finger on.

Having lost all confidence, Spengler and Van Hengel, asked another law firm, Vriesendorp & Gaade, to take over. On 15 June 1922, after the Koch patent had been published, but not yet officially approved, Vriesendorp & Gaade formally opposed the granting of the patent on the ground that the application by the navy officers should have precedence, inasmuch as electrical rotor machines were concerned. They also questioned the role of N. V. Vereenigde Octrooibureaux, as having been involved in both applications, asking for an investigation.⁷¹ On 26 March 1923, however, the Patent Council declared the opposition unjustified on both counts. Koch's patent extended to electrical machines as well and there was little ground for an investigation, because Spengler and Van Hengel could not prove anything.⁷²

On 21 June 1923 Spengler and Van Hengel appealed against this decision with the Committee of Appeal of the Patent Council. Once again, they referred to the strange fact that N. V. Vereenigde Octrooibureaux had been instrumental in submitting both applications to the Patent Council, but they were more explicit than before about Koch's patent being more or less a copy of theirs:

In Koch's patent application the key works in exactly the same way as in ours and the idea behind it is the same as well. The drawing is fully identical with ours and even the idea of switching [the path of the current from one rotor to another] can be found in our blueprint too.⁷³

The inventors pointed to the patent attorney for being responsible for these similarities and they demanded that Koch explain how he got his idea in the first place. They were unable, however, to point to Jurriaanse as having participated in both applications and nobody knew that Huybrecht Verhagen was Koch's brother-in-law. Spengler and Van Hengel wanted the decision of the Patent Council to be abolished or, at least, to be readjusted in such a manner that they could get their patent granted after all.

On 7 July Knoop Pathuis submitted his plea. According to him, Koch had

⁷⁰Jurriaanse and Knoop Pathuis to the Patent Council, the Hague, 1919, October 7: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁷¹A. C. Gebhard to the Patent Council, the Hague, 1922, October 14: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁷²G. Doorman to Knoop Pathuis and Gebhard, The Hague, 1923, March 26: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁷³Spengler and Van Hengel to the Patent Council, Den Haag, 1923, June 21: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

no obligation whatsoever to explain how he got his idea. On the contrary: Spengler and Van Hengel had to prove that they were not making false accusations. N. V. Vereenigde Octrooibureaux had simply been dealing with the two applications independently.

Mr. Verhagen had not the faintest idea that a competing patent application was being prepared by our colleague Mr. Jurriaanse and neither had I. I can not and will not deny that we are familiar with Mr. Spengler and Mr. Van Hengel's invention, but we became so only after we had completed our work on behalf of Mr. Koch.⁷⁴

On 13 December 1923, the Committee of Appeal reached a verdict. It showed itself fully satisfied with this explanation and refused to investigate the matter any further. The objectivity of this decision is questionable, however. The council was presided over by H. Bijleveld, who had been minister of the navy on 23 September 1919, and he was the one who had urged Spengler and Van Hengel *not* to go to the patent office in the first place.⁷⁵ If he had not done so, the patent would have gone to Spengler and Van Hengel. Moreover, if he had carefully read the documents in the file, he would have known that Jurriaanse had been involved in the preparation of both application and that Knoop Pathuis, therefore, was not telling the truth. This was sufficient ground for an investigation, but Bijleveld preferred to turn a blind eye. The appeal was declared inadmissible, because Koch filed his patent first and the plaintiffs had not been able to sustain their statement that their invention had been copied.⁷⁶

Spengler and Van Hengel had no other choice left than to give up. On 21 October 1921 Spengler was put in command of *De Zeven Provincieën*: the ship where his invention was first tested. He remained in active service until 24 May 1923, starting a new life on shore as secretary and adviser to the board of N. V. Trangkil, a mining company with stakes in the Dutch East Indies, in The Hague. He died on 10 March 1955. On 30 April 1925 Van Hengel was put in charge of Willemsoord, the same navy cadet school where he had met his friend over thirty years before, and he remained there until 1 April 1927. After his retirement he acted as administrator of the *AKU* Pensionfund in Ede. He died on 25 January 1939 in Velp.

⁷⁴Knoop Pathuis to the Patent Council, 1923, July 7: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

⁷⁵J. Alingh Prins, G. H. E. Bergsma *et al.*, *Octrooiraad, 1912-1937: Gedenkboek uitgegeven ter gelegenheid van het vijf-en-twintig jarig bestaan* ('s-Gravenhage: Zuid-Hollandsche Uitgevers Maatschappij, 1937), 42.

⁷⁶Decision of the Patent Council(Committee of Appeal), The Hague, 1923, December 13: Rijswijk, Bureau voor Industriëel Eigendom, filenumber 13046.

CONCLUSION

In 1915, the Dutch rotor machine was invented where it was needed most badly: to protect radio communication between the Dutch fleet squadron in the East and the commander of the navy in Batavia. The squadron commander was not allowed to undertake any action against foreign ships violating Dutch neutrality without consulting the authorities in Batavia first and for good reason. The Dutch fleet squadron could easily drag the country into a war that nobody wanted, just by obeying orders too strictly.

The machine was invented by two first sea lieutenants, Th. A. van Hengel and R. P. C. Spengler. Needless to say, it was intended for military purposes, not for commerce. This does not mean, however, that the changing climate in engineering had nothing to do with it. Both Spengler and Van Hengel had recognized engineering skills they both had played an important role in the navy's efforts to improve the torpedo and this had made them more knowledgeable about applied mathematics than many others in the navy.

The rotor machine was not patented by the original inventors, because they could not reach an agreement with Navy Minister Bijleveld about who owned the machine: the Dutch navy or the officers who invented it. Unfortunately, the navy officers had contacted a patent attorney, A. E. Jurriaanse, partner in N. V. Vereenigde Octrooibureaux, without waiting for the minister's permission. This put N. V. Vereenigde Octrooibureaux in a rather awkward position, because that could easily make it a party in a conflict it did not want with one of its most important clients. After consulting the minister against the rules of confidentiality, the director of the firm, H. Blaupot ten Cate, a known promoter of German business interests, decided that the patent could better be filed by a civilian and he found the electrical engineer H. A. Koch, a brother-in-law of Huybrecht Verhagen, one of the partners in N. V. Vereenigde Octrooibureaux, ready to do it. A. E. Jurriaanse, participated in the handling of both patent applications. He took great care that Koch's application was filed first, on 7 October 1919.

On 5 May 1922, the rights were transferred to N. V. Ingenieursbureau Securitas, a company with Koch as director, and registered the day before. It was controlled from Berlin and the patents it acquired show that it closely collaborated with Scherbius & Ritter, later the Chiffirermaschinen Aktiengesellschaft. Its main purpose seems to have been the evasion of a possible ban on the manufacturing of cipher machines by the Inter-Allied Arms Control Commission. The patents for the Enigma were evenly divided between Securitas in Holland and the Chiffirermaschinen Aktiengesellschaft in Germany and it was increasingly difficult

to tell whether the machine was Dutch or German in origin. Moreover, Dutch Securitas could take over the export of the Enigma to third countries, should this prove difficult to do from Germany too.

Spengler and Van Hengel fought the granting of the patent to Koch until the Court of Appeal of the Patent Council reached a unfavorable verdict on 13 December 1923, because they were unable to prove that they had been deceived by their patent attorneys. The objectivity of this decision is highly questionable, however, because the court was presided by the chairman of the Patent Council, H. Bijleveld, who had challenged the idea that the rotor machine was their intellectual property in the first place—when he was still minister of the navy. Spengler and Van Hengel never got any credit for the invention of the rotor machine, but they were nevertheless—two years before Hebern and three years before Scherbius—the first in history ever to have designed one. This means that the priority for the invention of the rotor machine goes to the Dutch.

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BIOGRAPHICAL SKETCH

Karl de Leeuw read history in Utrecht and has a degree in computer science from the University of Amsterdam. He has written his PhD about the history of cryptology in the Netherlands and he has published 12 articles in scientific journals, such as *Cryptologia* (1993, 1995, 2001), *Diplomacy & Statecraft* (1999) and *The Historical Journal* (1999).