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The History of Nippon Kogaku 1600 - 1949

2008

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Picture made in December 2006 by Gary Hawkins at Leica factory in Solms.

1. Introduction

1. How to write all these names

During my research I found out that various authors are using various names for - probably - the same factory. It is still difficult to translate or adapt a Japanese character into our Latin script. I think that fore example both 'Nippon' and 'Nihon' are the proper transcriptions of the same Japanese character.

I've discovered the following names:

Nippon Kogaku Kabushiki Kaisha
Nihon Kogaku Kaisha
Nihon Kogaku
Fujii Lens Seisakusho
Fujii Lens Seizo-sho
Fujii Brothers
Fujii Lens
Iwaki Glass Seisaku
Iwaki Glass Seisaku-sho
Tokyo Keiki Seisakusho

As to Mr. Mikio Itoh, working at the office of Collecting Materials for Company History, Public Relations Section, Corporate Communications & IR Department, from the Nikon Corporation it should be:

Fujii Lens Seizo-sho
Iwaki Glass Seizo-sho
Nippon Kogaku Kogyo Kabushiki Kaisya (in Japanese) -
Nippon Kogaku K.K. (in English)
Tokyo Keiki Seisaku-sho

That's why I will use these names in this publication.

2. Foreword

Why 1600 till 1949?
I'll start in 1600, because the first Dutch visited Japan. And by the Dutch ships came all the first optical toys to Japan. Dutch doctors give the first photographical lessons, and thanks to the Dutch, Mitsubishi has nowadays a forgeron. Thanks to Mitsubishi there is Nikon and even Nikon uses some steel.
I'll stop in 1949, 2 years after the Nikon I rangefinder camera came to the market. A lot of other publishers wrote about the rangefinder period.

2. The optical history

There is a lot of information about the optical history on the internet. So read this information by the following links, which I found very useful:

1. Camera obscura

See: http://members.tripod.com/~wzzz/HAITHAM.html

See: http://www.acmi.net.au/AIC/CAMERA_OBSCURA.html

2. Telescope

See: http://galileo.rice.edu/sci/instruments/telescope.html

3. Binoculars

See: http://www.europa.com/~telscope/binohist.txt

4. Microscope

http://www.visioneng.com/technology/microscope_history.htm

3. History of optical companies

1. History of Barr & Stroud (Scotland)

See: http://www.nahste.ac.uk/cgi-bin/view_isad.pl?id=GB-0248-UGD-295&view=basic

See: http://www.archives.gla.ac.uk/collects/catalog/ugd/251-300/ugd295.html

2. History of Bausch & Lomb (USA)

See: http://www.germanheritage.com/biographies/atol/bausch.html

3. History of Leitz (Germany)

See: http://www.kbcamera.com/timelineliecahistory.htm

See:
http://en.wikipedia.org/wiki/Leica#Leica_camera_history_-_.22The_father_of_35_mm_photography.22

4. History of Throughton & Simms (England)

See: http://www.ast.cam.ac.uk/~ipswich/History/Troughton_and_Simms.htm

5. History of Hensoldt (Germany)

The “Optische Werke Hensoldt & Sohne”was founded in 1852 and 1928 they became a part of Zeiss.

http://www.smt.zeiss.com/c12567a80033f8e4/Contents-Frame/8e4f89e09e5ef290c1256fb8002dac6a

6. History of Carl Zeiss (Germany)

See: http://www.company7.com/zeiss/history.html

See: http://www.zeisshistorica.org/telescopes.html

7. History of Kershaw (England)

See: http://shutterbug.com/columns/0305classic/

8. History of Krauss (France)

See: http://www.europa.com/~telscope/tsfrance.txt

9. History of P.J. Kipp & Zonen (the Netherlands)

See: http://mattson.creighton.edu/History_Gas_Chemistry/ErnstHomburgArticle.html

See: http://www.sic.iuhps.org/conf2000/ox_s07a.htm

See: http://www.kippzonen.com/pages/1093/3/History

See: http://www.kippzonen.com/

10. History of Doctor (Germany)

In 1991, the Eisfeld factory of Jenoptik Carl Zeiss (550 employees) was taken over by Bernhard Docter, and began production of binoculars, riflescopes, spotting scopes, magnifying glasses and opto-electronic measurement equipment under the Docter name.

See: http://www.docter-germany.com/ click on 'English', and search 'history'.

11. History of optical glass

Joseph Fraunhofer of Munich made the first quality optical glass in the early 1820s but with the use of heavy metals in the furnace in the creation process, many glass workers of this day were poisoned by the process. Fraunhofer died at the early age of 39 and his proprietary methods of glass manufacture died with him.

The major manufacturers before Schott were the Chance Brothers in England and Parra Mantois in France. None reached the level of sophistication of Schott before him and most optical glass was imported from these two firms until Schott's breakthroughs. The term Jena glass applied to many of the glass products of Schott and not to just optical glass. These two firms and Bausch & Lomb would begin serious optical glass manufacture with the advent of World War II when Schott materials began to be held inside Germany for an obvious optical munitions advantage.

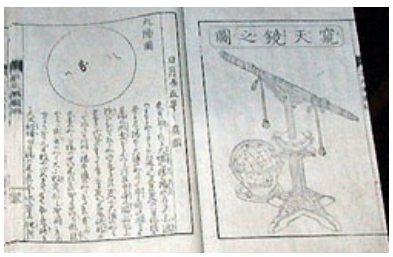
Otto Schott

Busch was a pioneer optical firm in Germany and was friendly with Zeiss but if binoculars were made under the Busch name - they were not subcontracted to Zeiss. Originally Zeiss was so small at the time of Schott's discoveries, it was Zeiss who subcontracted to Voigtlaender the manufacture of early photo lenses and some of the earliest binoculars.

4. History of optical industry in Japan

In 735 a group of merchants sent from Japan to China returned with astronomical instruments. In 875 an observatory, which possibly may be the earliest astronomical observatory in Japan, was established at Asuka in the Nara Prefecture.

In the Genna era (1615-1623) Tohichi Ikushima made a telescope, which caused the Tokugawa Shogunate to prohibit telescope manufacturing because of its possible military applications.



Dutch lessons (photo author)

During the Kioho era (1717-1735) Nizayemon Mori, an optician in Nagasaki, made an astronomical telescope, and/or a Sokugohyogi (type of transit instrument) for the eighth Shogun Yoshimune Tokugawa.

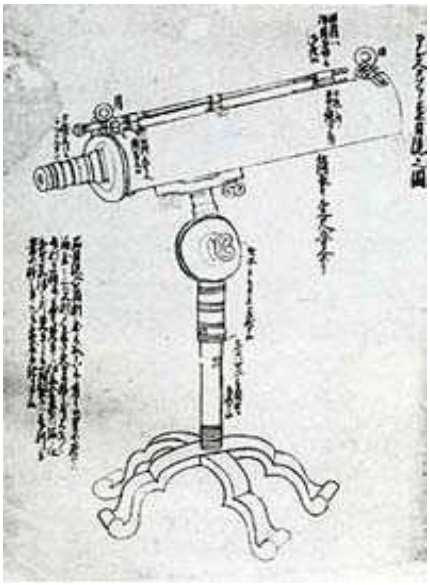
In 1859 observation towers were built on the coast at Kosetoura, Nomo and Noroshi Yawa, equipped with telescopes to view the arrival of foreign ships.

1. Early telescopes

See for this history an article from Peter Abrahams: The History of the Telescope in Japan: http://www.europa.com/~telscope/tsjapan.txt

Peter Abrahams: *"The Telescope in Japan, 1600-1900*

Long before the birth of modern Japanese telescopes, there was a tradition in Japan of craftsman fabrication of highly decorative small telescopes. European telescopes were introduced to Japan in 1613, and within a decade, a telescope had been fabricated. Production in quantities began circa 1800, with small refractors by Zenbei Iwahashi and Gregorians by Kunitomo Tobei. Craftsmanship was developed ab initio; involving materials such as quartz, optical glass, and speculum metal; and processes of precision metal fabrication. A few observatories were constructed for telescopic astronomy."



Drawing of Kunitomo, Ikkansai reflecting telescope From: http://img2.tfd.com/wiki/e/e2/Kunitomo1832Telescope.jpg

"In 1640 Francois Caron (a French refugee) from the Netherlands got an invitation to visit Tokugawa Ieyasu in Edo. He arrived on Mai 12, 1640 and brought with him some presents. Two bronze mortars, some candlesticks with wax candles and a telescope with some golden inlay. Two other gifts of Francois Caron can still be seen outside te mausoleum of Ieyasu in Nikko, two big green candlesticks." (From: Le puissant Royaume du Japon, Chandeigne, Paris, France, 2003, page 188-190.)
(http://www.answers.com/topic/fran-ois-caron)

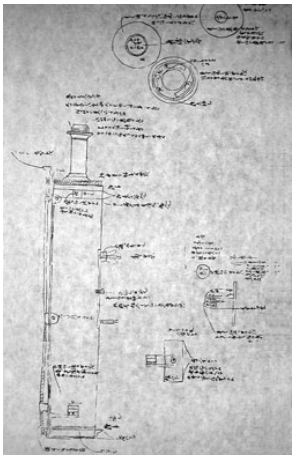
The National Science Museum in Tokyo, Japan:
http://www.kahaku.go.jp/english/
has a special department with early optical instruments. It shows some early Japanese telescopes and observatory instruments. I learned in this museum that the making of telescopes in Japan in the Edo period lagged far behind European countries, some of the first skilled telescope makers were Mr. **Kunitomo** and Mr. Iwahashi.

From Wikipedia: ***Kunitomo,*** *Ikkansai (November 21, 1778-December 26, 1840) was a Japanese gun manufacturer of the early 19th century, who, after having spent several months in Edo where he could get accustomed with Dutch wares, built in 1831 Japan's first reflective telescope, of the Gregorian type, a European innovation made in 1670.*
Kunitomo's telescope had a magnification of 60, and allowed him to make very detailed studies of sun spots and lunar topography. Four of them remain to this day.
Air gun developed by Kunitomo, circa 1820-1830.
Air gun developed by Kunitomo, circa 1820-1830.
Air gun trigger mechanism.
Air gun trigger mechanism.
Kunimoto also developed manufacturing methods for guns, and also created an air gun based on rangaku knowledge acquired from the Dutch in Dejima.
(From http://en.wikipedia.org/wiki/Kunitomo_Ikkansai)

2. The start of the photographical industry

"*Delving far back in to the records, it turns out that lens polishing was being done in feudal Japan in the ancient days of the Tokugawa Shogunate, before Commodore Perry knocked this island nation's doors open to the Western civilization. Production on an industrial sale started in 1907 with the establishment of the Fujii Lens Seizo-sho factory which manufactured binoculars for the civilian market as well as for use by the Imperial Japanese Navy. But it was not until the First World War that the optical industry really began spreading its roots. By this time the Navy had launched its own production of sextants, periscopes, and other optical precision instruments. The Navy also established its own research laboratory.*
Probably the biggest factor spurring the industry on at this time was the abrupt stoppage of lens glass imports because of the German wartime blockade. The industry had until the relied solely on these imported raw materials for the manufacture of finished products. In desperation, optical instrument manufacturers searched far and wide for other sources and, to their pleasant surprise, found an abundant source right in their own backyard; this was in 1921.

Five years later, with several firms already in the lens-making business in addition to Fujii, yet another new establishment hung to sign that was to become one of the most famous names in the industry both at home and abroad. It was Nippon Kogaku, makers of the post-World War II Nikon cameras, NIKKOR lenses, and a wide range of diversified optical instruments.



Dutch lessons (photo author)

Up this point we have been talking about the beginnings of lens and optical instrument making. It wouldn't be accurate to trace the origins of the camera industry as such this far back, although, for the record, a handful of Japanese began dabbling experimentally in camera making in the 1880s.

The first camera bearing the made-in-Japan tag hit the market in 1903. Several years before Henry Ford came out with his Model T. It was named the Cherry Camera (Cherry Portable) and it was an Meish 57x83 millimeter plate format format box camera, manufactured by the Konishiroku Photo Industrial Company, Limited, or Konishi Honten, now Sony, a firm generally recognized today as the oldest Japanese manufacturers in the industry not only of cameras but of a complete line of photographic film and printing paper. One of its best-known products today is the Konica 35-millimeter camera. Konishiroku Shasin Kogyo Kabushiki Kaisha was founded in 1873. It was also known as Rokuosha. In 1928 they produced a four element lens in Tessar style. In 1931 they produced with Jena glass an 135 millimeter f/4.5 lens called Hexar. The design was a success, some said equal of the Zeiss Tessar". Quoted from the April 1957, page 140, in The Japanese Photo Industry Magazine from 1958.

3. Japanese optical history

This time line contains information based on a variety of sources:

1857 Naval doctor Julius L. C. Pompe van Meerdervoort starts teaching photography at the Medical Institute in Nagasaki, the centre of Dutch learning. Among his students were Hikoma Ueno, Kuichi Uchida and Genzo Maeda. Meerdervoort and other foreigners introduce the wet-collodion process around this year and up to 1859. The three treaty ports of Yokohama, Nagasaki, and Hakodate become the centres of photographic learning in Japan.

1862 Hikoma Ueno (1838-1904) (father Shunnojo Tsunetari Ueno), after learning photography and chemistry under Dr. Pompe van Meerdervoort, publishes the treatise, Seimikyoku Hikkei which described photographic techniques and the wet collodion process. Ueno Hikoma becomes one of the first professional Japanese photographer by opening a photo studio in Nagasaki called Ueno Satsuei-kyoku.

1864 Kokichi Kizu opens a photo studio in Hakodate (Hokkaido), one of the ports which were opened to foreigners.

1865 As the result of a Japanese Mission to Holland (and Delft) the Dutch firm Kipp & Zoon instruments begin to export measuring instruments and binoculars to Japan.

1865 Kuichi Uchida, who studied under Hikoma Ueno, and Shinsuke Nakagawa both open a studio in Osaka.

1865 Yohei Hori (Masumi) opens a photo studio in Kyoto.

1866 Rihei Tomishige opens a photo studio in Yanagawa, Fukuoka Kyushu.

1870 The number of professional photographers in Japan exceed 100.

1871 Tokichi Asanuma establishes Asanuma Shoten, a photo supply shop in Nihonbashi, Tokyo.

1873 Matsugoro Asakura is sent to Austria by the Japanese government to study the manufacturing of optics. He returned to Japan in 1875 and started to build a lens factory with government approval. Matsugoro died before finishing the factory, which was completed in 1876, producing ophthalmic lenses using imported glass. His son, Kametaro Asakura, developed a photographic lens after 1883, exhibiting it in 1890, the first known Japanese made multi element photographic lens (there were earlier singlet objectives).

1873 Konishi-ya, forerunner of Konica, is established in Kojimachi, Tokyo. It later moves to Honcho in 1876 and changes its name to Konishi Honten.

1876 Students of Matsugoro Asakura complete the lens factory and start to produce ophthalmic lenses with imported glass. (Glass melting technology was still undeveloped in Japan.)
1876 The Ministry of Industry established the first high-quality glass manufacturing plant in 1876. Located in Shinagwa, Tokyo. This factory was controlled by the government to produce flat glass and other glass goods. The factory soon failed because the government underestimated the level of technology required to mass-manufacture glass products.
1877 The number of professional photographers in Tokyo alone exceed 100.
1879 "Shashin Shimbun," a weekly photo by Zenshin-sha, is published with albumen prints pasted on. Publication ceases after 10 issues.
1883 Matsugoro Asakura's son, Kametaro Asakura, developed a photographic lens at his factory in Yotsuya Denmacho and displayed the lens at the 3rd National Industrial Exhibition in 1890 where it won 1st prize. This was the first photographic lens produced in Japan, except for simple single-element lenses.
1890 Tokyo Denki, originally named Hakunetsusha, was established in 1890 and was Japan's first producer of incandescent electrical lamps. The company diversified into the manufacture of other consumer products, and in 1899 it was renamed Tokyo Denki (Tokyo Electric), nowadays Toshiba. (See: http://en.wikipedia.org/wiki/Toshiba) In the 1920s they produced flint glass for electric lamp envelopes.
1892 Take a look at a row of Japanese cameras an you'll notice shutters bearing the name of Seikosha. This firm opened for business in 1892 as a manufacturer of watches and clocks, and its scale of operations and exports today make it easily the biggest of its kind in the Far East. In 1930 they started making shutters, and today almost all Japanese cameras are equipped with Seikosha shutters.
1902 Konishi Honten establishes Rokuoh-sha in Tokyo, a division dedicated to produce photosensitive materials (dry plates, etc.) and later photographic equipment.
1903 The Cherry Portable, the first portable Japanese camera, is made by Konishi Honten (forerunner of Konica). The box-shaped camera used a magazine which held twelve 2 1/4x3 1/4 inch dry plates. Konishi Honten went on to make various other cameras. Paper-backed roll films were still not made in Japan. Only sheet film and glass plates were being made in Japan. Imported roll films were still very expensive and usually arrived in poor condition because there were no refrigerated cargo holds.
1903 Japan's first photographic paper, the Sakura Hakkin type paper, is marketed by Konishi Honten.
1904 In early 1904, Magoichi Shimada produced flat glass on a very limited basis. (see: http://www.toyo.sasaki.co.jp/e/company/history.htm)
1907 Kuribayashi Seisaku Sho, the forerunner of Petri Camera, is founded as an photographic accessory manufacturer. The first camera was made in 1919, the first lens in 1942. There was an bankruptcy in 1977, closed down in 1979.
1907 Konishi Honten markets Japan's first single-lens reflex camera, the Sakura-reflex Plano with a Tessar f/6.3 lens. Priced 225 yen.
1907 In 1907 the Asahi Glass Co., Ltd. In 1907 was established by mr. Iwasaki, Toshiya. This firm was Japan’s first successful commercial glassworks, although it was not able to produce optical grade glass. (see: http://www.agc.co.jp/english/company/history/index.html)
1909 Ryuzo Fujii establishes the Fujii Lens Seizosho factory.
1909 The Japanese had in this year already established an optical research laboratory (See: 50 Years history of the Nikon Company, page 56. Gojunen no ayumi / 50-nenshi) in Tokyo, and in 1909 a repair facility was further established in order to service optical weapons belonging to the Japanese army. Combined with the experience gained in maintaining instruments such as field binoculars and cameras, the facility also began producing telescopes and microscopes for a variety of applications. Shortly thereafter, production expanded to include prisms for binoculars and even lenses for photographic cameras. By the outbreak of the First World War in Europe, however, the question of self-sufficiency in optical munitions had yet to be seriously considered. Japan's armed forces were almost entirely dependent upon overseas suppliers of optical weapons, and this supply was sharply limited during the war as the combatant powers suspended their exports of munitions in general.
1911 Rokuoh-sha markets Japan's first pocket-size camera called the "Minimum Idea." Its relatively affordable price of 9 yen and 50 sen creates a Minimum Idea boom among amateurs.
1915 The Japanese Navy starts to develop optical glass manufacturing since glass imports from Germany stopped due to World War I.

1917 Nippon Kogaku K.K. (forerunner of Nikon) was established in Tokyo as a munitions optical instrument shop to meet the needs of the Imperial Japanese Navy. The company was a consolidation of three companies: Tokyo Keiki Seisaku-sho's optical division, Iwaki Glass Seizo-sho, and Fujii Lens Seizo-sho.

1918 The significance of this over-dependence upon foreign suppliers was not lost upon the army or navy, which made serious efforts after 1915 to address the problem of domestic production of both optical glass and optical munitions. In 1918 navy researchers at the Tsukiji Arsenal, south of Tokyo, began to produce seven types of optical glass in quantities of up to 300 kilogram melts in an effort to compensate for the interruption of German imports..

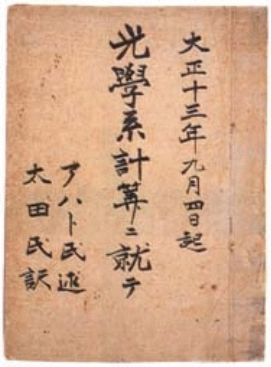
1919 Asahi Kogaku Goshi Kaisha (forerunner of Asahi Optical Company, Ltd., maker of Pentax cameras) is established in Tokyo by Kumao Kajiwara as a manufacturer of ophthalmic lenses. Although it was not until much later that it added cameras to its line of products. In 1923 Asahi produced their first photographic optic, the Aoco motion picture projection lens. In 1929 Asahi began to manufacture lenses for still photography and by 1943 the company was a major supplier of lenses for other camera manufacturers, like Minolta and Konishiroku. After the war, most of the factories where destroyed. In 1948 Asahi Optical reopened with manufacturing binoculars for export.

1919 Takachiho Seisaku-sho, the forerunner of Olympus Optical Co., Ltd., is established as a microscope manufacturer. In 1936 Olympus made its first photographic lens, a 75 millimeter f/4.5 copy of the Zeiss Tessar. Olympus also made lenses for Mamiya, Elmo, Aires and Walz.

1920 Shigejiro Nishimura & Sons, in Kyoto, began by making reflectors, managed by K. Nakamura of Kyoto Imperial University. As of 1931, Nishimura had produced one 10 inch f3.8 photographic reflector, three 8 inch, three 6.5 inch, twenty five 6 inch, and over two hundred 5 inch & smaller reflectors, all with mirrors by K. Nakamura. In 1929, Nakamura made a 6 inch refractor, on a mount designed by Nakamura, which was the first equatorial refractor built in Japan (followed closely by a Nippon Kogaku 6 inch equatorial of Zeiss design).

1921 The Osaka Industrial Material Testing Laboratory starts research on optical glass melting. Completely independent from the Navy, this Laboratory belonging tot the Department of Agriculture and Commerce. Prior to this time optical glass was imported from Germany, France and England.

1921 Nippon Kogaku Kogyo K.K. hires eight German engineers and scientists on a 5-year contract. They worked on optical design, product design, and lens and prism grinding and polishing. One of them, Heinrich Acht, extended his stay until 1928. He produced samples of photographic lenses, the first ones to come from Nippon Kogaku. Kakuno Sunayama took over lens design after Acht and improved upon Acht's 50 centimeter f/4.8 lens in 1929, calling it "Trimar." In the same year, he later produced the "Anytar" 12 centimeter f/4.0 lens based on the Carl Zeiss Tessar lens.



Heinrich Acht (from 75 Years)

1922 The Astronomical Herald published articles by Masamitsu Yamazaki on making reflecting telescopes, which resulted in an amateur telescope making movement, numbering over 200 by 1931. (The Herald is the monthly of the Nihon Tenmon Gakkai, Japan Astronomical Association)

1924 Masashige Tomioka founded Tomika Kogaku Kenkusho in the Shinagawa district of Tokyo to develop photographic lenses. In 1932 the laboratory became a manufacturing facility, Tomioka Kogaku Kikai Seizosho, and made original lenses for camera companies. Today they produce most Yashica lenses.

1925 In June, Konishiroku Honten Co. introduces the Pearlette camera, an imitation of the highly successful Vest Pocket Kodak. It had a bellows and an imported lens and shutter. It used 127-type roll film. The Pearlette line was in production for 20 years and was improved over time.

1926 Seizo Goto founded Goto Optical, in Komazawa, Tokyo, in August of that year.

1928 Kazuo Tashima establishes the Nichi-Doku Shashinki Shoten (Japan-Germany Camera Company), the forerunner of Konica Minolta Camera Co. The corporate name was changed to Molta Goshi Kaisha in 1931 and to Chiyoda Kogaku Seiko K.K. in 1937 when the company began lens production.

The name also changed to Chioda Kogaku Seiko Kabushiki Kaisha. The first Minolta Rokkor lens was an 200 millimeter f/4.5 for an portable aerial camera in 1940. By order of the Imperial Japanese Navy, Minolta started to develop and produce optical glass at Itami, near Kobe. In 1942, the company was ordered by the Imperial Japanese Navy to manufacture optical glass near Kobe. The 75 millimeter f/3.5 Rokkor lens, modelled after the Carl Zeiss Tessar lens, fitted on the Minolta Semi IIIA camera in 1946 was the first Japanese lens with anti-reflection coating.

1931 Nippon Kogaku K.K., in Shiba, Tokyo, had produced hundreds of refractors by 1931, as large as 8 inches, on equatorial mounts. Prototype 20 inch fork mounted reflectors had been made.

1931 Hirowo Mohri of Konishiroku Honten Co. produces a f/4.5, 4-element H-type lens with Jena glass. The lens, named "Hexar," was based on the Carl Zeiss Tessar lens. "Hex" is for Rokuemon Sugiura where "Roku" means six. The lens was a success and claimed equal performance to the Tessar lens. The "Hexar" label was used on Konishiroku's top-quality lenses up to 1959, when the lenses were renamed Hexanon.

1931 Military & Naval optical instruments were made by Government Optical Works.

1932 Nippon Kogaku Kogyo K.K. manufactures its first NIKKOR photographic lens. This was later mounted on the Hansa Canon camera in 1936. All lenses from Nippon Kogaku were labelled "NIKKOR" from this year on. And all pre-World War II Canon cameras were fitted with NIKKOR lenses.

1932 Tokyo Optical (Tokyo Kogaku Kikai Kabushiki Kaisha) began in 1932, under the direction of the Imperial Japanese Army. The optical division of the Seikosha factory of Hattori Tokei, a clock and watch manufacturer, was merged with Katsuma Kogaku Kikai Seisaku Sho. The new company was formed to manufacture photographic lenses and precision optical and mechanical instruments. There is an similarity with the founding of Nippon Kogaku. By 1934, it had produced two triplet photographic lenses, the State and the Toko, in f/6.3 and f/4.5 apertures. The designer, Ryoii Tomita, made an 0.5 centimeter f/0.7 design in 1944, which was later sold to the US Occupation forces. After the WWII they made Topcon single lens reflexes and Topcor lenses.

1933 In November, Seiki Kogaku Kenku Sho (Precision Optical Instruments Laboratory), the forerunner of Canon Inc., is established by Goro Yoshida (1900-1993) and Saburo Uchida (1899-1982). They are soon joined by Takeo Maeda and they produce the prototype Kwanon 35 millimeter camera six months later. The production model introduced in 1935 was called "Hansa Canon." It used a NIKKOR lens from Nippon Kogaku. Yoshida left Seikos Kogaku in the fall of 1934, less than a year after setting up Seikos Kogaku.

1934 Fuji Photo Film Company (Fuji Sasin Film Kabushiki Kaisha) is established in Jan. to produce photosensitized materials. In 1938, it announced that it would develop all photographic equipment including the melting of optical glass and lenses. During World War II, it made aerial cameras and lenses. After the war, it concentrated on optical glass and studio camera lenses, named Rectar. In 1954, all lenses were named Fujinar or Fujinon.

1935 In April, the "Super Olympic" with a lens shutter is marketed by Asahi Bussan (forerunner of Ricoh). This is the first 35 millimeter camera made in Japan.

1935 In May, Mitsubishi Paper Mills and Konishiroku complete joint research to develop Japan's first practical fiber-based photo paper.

1935 In June, Takachiho Seisaku-sho, forerunner of Olympus Optical Company, makes its first photographic lens, a 75 millimeter f/4.5 modelled after the Carl Zeiss Tessar lens. "Zuiko" was the name chosen by the company for its lenses.

1935 In July, the Semi Minolta, Japan's first 6x4.5 centimeter format camera using 120 roll film is marketed by Molta Goshi Kaisha.

1936 The Riken Optical Industries Limited established. Heir mass production method for making Ricoh's and Ricohflexes today provide part of the reason why it is Japan's largest manufacturer of popular priced cameras.

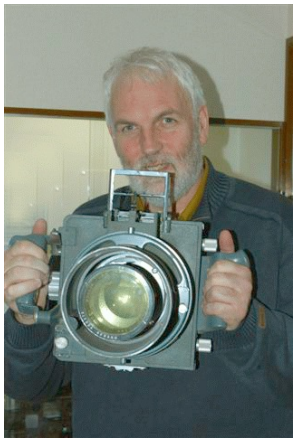
1936 In September, the Hansa Canon, Japan's first 35 millimeter rangefinder camera with a focal-plane shutter is produced by Seiki Kogaku Kenkusho (forerunner of Canon) and sold by Omiya Photo Supply Co., Ltd. It had a NIKKOR 50 millimeter f/3.5 lens and a pop-up viewfinder. The Hansa Canon was an imitation of the Leica II. The name "Hansa" was a trademark of Omiya Photo Supply Co., Ltd. Seiki Kogaku, a virtually unknown company, still had no distributor for the camera so it gave sole distribution rights to Omiya and permission to incorporate the "Hansa" trademark.

1936 In November, Japan's first 2 1/4 square (6x6 centimeter) format camera, the Minolta 6, is marketed by Molta Goshi Kaisha.

1937 In August, Canon forerunner Seiki-Kogaku Kenkusho (Precision Optical Laboratory) incorporates into Seiki-Kogaku Kogyo K.K. (Precision Optical Industry Co., Ltd.). This is Canon Inc.'s official year of founding. The new company is headed by Saburo Uchida one of the original founders of the Laboratory.

1937 Konishiroku Honten changes its name to Konishiroku Co., Ltd. and began making aerial cameras and X-ray photographic equipment.

193X Konishiru Co. Ltd. Makes an Photo Machine Gun, model 89-2. With the 35mm film 18x24mm size pictures can be made. The lens is an 75mm Hexar f4.5. It has a 1/300 second only. The JCII Museum in Tokyo has one on display.



Konishiroku Honten aerial camera (photo: Chris Sap)

1939 Nippon Kogaku and Konishiroku received a request from the Japanese Airforce to produce a small film (35 millimeter) camera, to be mounted in the wing of an airplane. The camera should work on motor and should make pictures of the damage that the bullets from the airplane causes. A test was done attaching a handle to a Leica. This resulted, in 1940, in a new prototype by Nippon Kogaku and Konishiroku called the 99 style micro aerial camera. See an article about this camera in NHS Journal nr 73, page 7. In 2005 I found a 1944 type of this camera made by Konishiroku in the Yokohama Radio Museum.

1940 In January, the Leotax camera is sold by Showa Kogaku Seiki. It was a copy of the Leica 35 millimeter camera except for the rangefinder which was not coupled to the lens.

1940 On July 7, camera production was restricted for military purposes only, stunting the growth of the Japanese camera industry.

1940 In September, Mamiya Koki Seisakusho produces the first Mamiya Six camera.

1941 In July, the Zenkoku Shashin Kikai Seizo Kogyo Rengokai association of photo equipment makers is formed to negotiate with the government on photography equipment matters such as official pricing revisions and equipment procurement and exportation.

1941 Mamiya Camera Co. was founded, and earned its first laurels with the Mamiya Six, a folding type camera whose most outstanding recent innovation is a device which permits the back of the camera to move back and forth for focussing instead of the traditional lens-movement focussing.

1944 Due to a military supply company law enacted in Dec. 1943, most of the major Japanese photo equipment and materials manufacturers are forced to co-operate in the war effort.

1945 During the first few years after the war ended in 1945, Japan faced severe shortages of raw materials. Camera companies were short on materials and capital to rebuild. They had to think about sheer survival rather than developing new cameras. Thus, the first Japanese cameras after the war were pre-war carry over.

1945 In December, the domestic manufacturing of film and cameras was restarted. However, the production volume was still low and most of the output went to supply the Occupation Forces, leaving little for the rapidly-increasing domestic demand. In large cities, a black market for film and cameras appeared.

1947 Camerabug American soldiers of the Occupation Forces commented that there were too many names to remember with regard to Canon cameras: lenses by Serenar, cameras by Canon, and the manufacturer was Seiki-Kogaku Kogyo. Company president Takeshi Mitarai took this to heart and changed the corporate name to Canon Camera Company Ltd. on Sept. 15, 1947. This name was later modified to Canon Camera Company Inc. in early 1951. The present corporate name of "Canon Inc." was adopted in 1969.

1948 Chinon Industries, Inc.'s forerunner, Sanshin Seisakusho, is established by Hiroshi Chino to manufacture lens barrels and mounts for cameras such as Olympus, Ricoh, and Yashica. It started manufacturing lenses from 1959. The corporate name was changed to its current one in Jan. 1973. After being dissolved after the war which destroyed most of the factory, Asahi Optical Co. was restarted. It made binoculars for export.

1949 In April, Canon Camera Company markets the Canon IIB 35 millimeter rangefinder camera having a viewfinder which could switch magnifications to match the field of view for the 50 millimeter, 100 millimeter, and 135 millimeter interchangeable lenses. This useful and unique feature helped to establish Canon's reputation for the following 10 years. The camera remained in production for 3 years.

1949 Takachiho Seisaku-sho is renamed Olympus Optical Company, Ltd. (Olympus Kogaku Kogyo K.K.)

There are several sites on the internet that give more information on this item. So please:
http://meltingpot.fortunecity.com/honduras/198/wz22.htm
http://photojpn.org/HIST/hist1.html

4. An example of military influence in 1931

Domestic lens manufacturing in 1931 was a goal of both the photographic industry and the Japanese military. Under official auspices, a number of firms were engaged in optical research including:

Nippon Kogaku Kabushiki Kaisha;
Konishi-Honten / Rokuosha;
Oriental Shashin Kogyo;
Takachihi Kogaku Kikai Seisakusho, now Olympus;
Tokyo Kogaku Kikai K. K.;
Molta Goshi Kaisha, originally Nichi Doku Shashinky Shoten, now Minolta;
Tomioka Kogaku Kenkusho;
Asahi Kogaku Goshi Kaisha;
Inoue Kogaku and
Yamazaki - Shuzando.

The first lenses were shown with the first Japanese between-the-lens shutters. In 1931, Konishi-Honten / Rokuosha produced with German glass, what is generally considered the first Japanese photographic lens (So, the Heinrich Acht 1921 lenses for Nippon Kogaku were not seen as Japanese lenses by Masao Tanaka and Hajimu Miyabe), the Hexar 105 millimeter. F/4.5 a four element lens in the configuration of the Tessar. In the same year, Nippon Kogaku completed a 120 millimeter Anytar lens for the 6.5x9 centimeter. format. which was never commercially produced. That year Asahi Optical completed a three element triplet, the Coronar 105 millimeter f/4.5, which was sold by Molta Goshi Kaisha with its Eaton and Happy Hands cameras. Asahi Optical had begun in 1929 to prepare photographic lens production; by 1934 it had become a specialized lens producer, and is believed to have made the lens for the Pearlette, the first camera of complete Japanese manufacturer. From the Masao Tanaka and Hajimu Miyabe chapter 5 in The history of the Japanese camera.

5. Roots of the Japanese optical industry

The VOC was the world's first multi-national company. They started at March 20, 1602. In this pre-industrial time zone, they shipped a lot of Western inventions. In this list you'll find an overview of some optical items the Dutch brought to Japan:
http://home.europa.com/~telscope/tsjapan.txt
Between 1640 and 1853, Dutch maritime traders provided the only commercial link which Japan maintained with the west, and were thus the sole channel for western ideas and knowledge and optical stuff to reach neo-Confucian society. The Shogun government had big interest in European astronomy and medicine, and the gradual development of interest in wider spheres of western knowledge and culture.

6. Japanese expansion

See http://www.japan-guide.com/e/e2130.html

These time periods were challenges for the Japanese. But they showed just how much Japan could overcome and how determined the Japanese were to succeed. The Meiji Restoration Restoration (1868) showed how quick learning the Japanese were. Though the western Industrial Revolution took 150 years, the Japanese changed out of their agrarian lifestyle to a factory filled city in 40 years.

After the Meji restoration, Japan became very nationalist. It also became very pro-western, and within a short period of time it even thought like England and Germany: Imperialism , lets expand, which it did. Eventually this led up to the second Sino-Japanese war.

See: http://en.wikipedia.org/wiki/Japanese_imperialism

For Japan colonialism was necessary for economic growth and national security. The new colonies provide new resources, labor and new markets. The new colonies gave buffer with the west. Nationalist could say: Asia for the Asians.

From 1868 on, Japan turned its energies to overtaking and surpassing the West through modernization. In the early Meiji period (1868-1912), the newly established Japanese government invited foreign experts from the US, Great Britain, France, Germany, and other countries to teach.

The Meiji Restoration (1868 - 1911) was the catalyst towards industrialization in Japan that led to the rise of the island nation as a military power by 1905, under the slogan of "National Wealth and Military Strength".
See for more info on the Meiji Restoration: http://en.wikipedia.org/wiki/Meiji_restoration

And see: http://en.wikipedia.org/wiki/Modernization_of_Japanese_Military_1868-1931

The production of domestically manufactured goods, such as optical glass, was one of the goals of the Japanese military. When Japan was cut off from its European source (Schott, Zeiss and Barr & Stroud), during the first world war (1914-1918), the military looked for Japanese producers.

In 1895, the Irish inventor John Philip Holland designed submarines that, for the first time, made use of internal combustion engine power on the surface and electric battery power for submerged operations. In 1902, some of his vessels were purchased by the United States, the United Kingdom, the Imperial Russian Navy, and Japan. The Japanese submarines were delivered in 1905.

7. The beginning of the Japanese lens

The Ministry of Industry established the first high-quality glass manufacturing plant in 1876. Located in Shinagawa, Tokyo. This factory was controlled by the government to produce flat glass and other glass goods. The factory soon failed because the government underestimated the level of technology required to mass-manufacture glass products.

Asahi Glass Co., Ltd. (since 1907) provided flat glass during the years just before the first world war. In the years before WW I. between 80 and 90% of all glass used in Japan came from Belgium, and all the supplies needed for the production of glass and raw materials as well.

The development of optical glass could not happen until two events took place in Japan.
First, certain key industries had to be established to supply the materials central to the production of high-grade polished and safety glass for the military and flat glass for domestic needs. Secondly the Japanese had to acquire from the west traditional recipes and secrets concerning the production of optical glass.

The manufacture of optical glass had roots in traditional recipes and secrets. And whichever country, at the time, had the best of these, was the leader in glass production; its firm produced the best lens systems. So after Switzerland (1805: Pierre Lois Guinand), France (1827: J.N. Lerebours and George Bontemps) and England (1848: Change Brothers Glass Company at Birmingham) came Germany. The knowledge and expertise of the Germans came at a price, for the high performance of their lenses rapidly reduced optical research and development in other countries. Simply stated, for a fee, any company could have the required technology and methods required to make the finest of the day.

At the time when Abbe and Schott were adding barium to optical glass, the first successful plate glass works was being established in Japan (Asahi Glass). It was a far cry from on optical glass production on a level with the Germans in 1902.

Several Japanese scientist studied in Germany, to learn more about optical glass production. One of them, Ryuzo Fujii studied optical design and production methods in Germany for three years before returning to Japan in the fall of 1901.

As the Japanese optical firms developed skills and acquired technology from European firms, the traditional recipes and secrets of lens making would eventually shift from occidentals to orientals.

With the advent of the first world war, imports into Japan of all types of manufactured glass from Europe ceased. The need for glass led to the formation, with intensive help from the Japanese government, of industries to produce materials and supplies used in the glass making. These were essential materials such as soda ash and refractory bricks used to line the furnaces.

When Japan's own national supply of materials such as these started in the early 1920's, an important step had been made towards developing and maintaining all types of domestic glass products. Resulting from all of these activity, the first real Japanese optical glass came from Japanese spectacle makers, such as Kato Optical, and from a light bulb manufacturer: Tokyo Denki, which produced flint glass for its electric lamp envelopes.

The Tokyo Higher Technical School (Tokyo Kogyo Institute) was asked by the Japanese navy to help with the production of optical lenses. This school had no success with their efforts. After 1918 their specialist joint the new Nippon Kogaku plant in Ohi.

See: Inoue Osumi. British Influence on the Shinagawa Glassworks:
http://www.historyofglass.org.uk/AIHV2003/PosterTues.htm

See this report from 1890 about the cooperation between Mitsubishi's doughter Kirin and Shinagawa Glass Works: http://www.kirin.co.jp/company/history/jb/pdf/1890/JBM18900916.pdf
In 2015 this report is no more available on the Kirin site: http://www.kirin.co.jp/company/rd/

See: http://www.shinagawa.co.jp/profile/index-en.html

See: http://www.af-info.or.jp/en/about/

5. Birth of Nippon Kogaku

The Meiji Restoration (1868 - 1911) was the catalyst towards industrialization in Japan that led to the rise of the island nation as a military power by 1905, under the slogan of "National Wealth and Military Strength".
See for more info on the Meiji Restoration: http://en.wikipedia.org/wiki/Meiji_restoration.

The English Barr & Stroud 42 Feet Type FA2 Range Finders became well known in the 19th century. They were introduced by Barr & Stroud (optical instrument engineers in Glasgow, UK since 1860, the company is now part of Pilkington Optronics.) in 1888 and the very high tech oriented Japan Navy immediately ordered them. The first one, bearing serial number 4, was installed on a Japanese battle ship in 1894. By May 27, 1905, every single battle ship of Japan's Imperial Navy was equipped with this range finder, in fact every single cannon! So this will have cost Japan a lot of Yen.

All Japanese Navy officers used only Zeiss binoculars, the best there was in the years 1880 - 1914.

The Japanese army knew that the Russian - Japanese war of 1904-05 was won with help from the British ships and rangefinders and German binoculars.

World War I, made it impossible for the Japanese, to import optical goods and optical glass from Germany. Japan joined the allied forces and Germany became the enemy. Japan needed a lot of optical goods for their own expansion. So if you can not import, than you make it yourself.

In 1906 Akira Ando, a naval officer, asked the Tokyo University for specified lens technology. Later, with help from Tokyo Keiki Seisaku-sho and Fujii Lens Seizo-sho, he made a rangefinder in 1913.

In 1915 the Japanese Navy starts to study optical glass manufacturing. The quality of the 4,5 meter Fujii rangefinder was not precise enough. So they send 2 naval officers to England, to study rangefinder design. In 1918 navy researchers at the Tsukiji Arsenal, began to produce seven types of optical glass in quantities of up to 300 kilogram melts in an effort to compensate for the interruption of German imports. I'm not sure when the Tsukiji Arsenal starts. I think in 1915. The research at Tsukiji stopped in 1923 as a result of the Kanto earthquake. The City of Tokyo constructed then a central wholesale fish market. Even Nikon enthusiast should visit this historical place and look for small lenses on the ground.

The orientation of the Meiji government and the wars fought against China and Russia contributed significantly to technological development in Meiji Japan (1868-1911). The roles played by the arsenals and the government-owned shipyards and factories in adopting and disseminating foreign technology helped the rapid Japanese industrialization.

During World War I, the France, England and Russia ordered a lot of field scopes from Japan. Their own industries could not supply enough.

1. The birth of Nippon Kogaku

In 1916 the Japanese Navy asked Mitsubishi to improve the quality of submarines . Mitsubishi was at that time already Japans biggest shipbuilding company. A main problem was a suitable periscope. And there was no factory that made periscopes. So lets make such a factory. And in 1916 there were only three factories which could produce optical glass.

Mitsubishi zaibatsu's fourth president, Mr. Koyata Iwasaki, decided to form Nippon Kogaku and raised the necessary funds for an operating capital of 2,000,000 Japanese Yen.

Koyata Iwasaki

The Nippon Kogaku Kogyo Kabushiki Kaisha was started up in Tokyo on July 25, 1917 as an optical instrument shop in order to meet the needs of the Imperial Japanese Navy. The aim was to put an end to the import reliance of the Japanese industry and army in this field. The company was formed through the consolidation of to parts of existing factories: some engineers of Iwaki Glass Seisaku-sho, and the optical division of Tokyo Keiki Seisaku-sho. These factories still exist today. The complete Fujii Lens Seizo-sho joined later that year in December 1917.

See the internet for the history of Mitsubishi:
http://www.mitsubishielectric.ca/corporate/our_history.html
http://www.mitsubishi.or.jp/e/h/people.html
Please click on this last site for several important persons. For example a story about Koyata Iwasaki:
http://www.mitsubishi.or.jp/e/h/feature4/intr_sph.html

2. Iwaki Glass Seizo-sho

The Iwaki Glass Seizo-sho had been operating since 1881. They made at that time ordinary sheet glass, household glass and no optical glass. In 1885 they made a mirror for a searchlight. And designed 60 centimeter and 75 centimeter (hobutsenankio) searchlights for the Imperial Japanese Navy in 1914 and 1915 respectively. In 1914 Iwaki Glass started experiments to produce optical glass.

An other part of Iwaki Glass stayed in business after 1917. Since 1955 it was working together with Asahi Glass (founded in 1907 by Toshiya Iwasaki, the second son of the second president of Mitsubishi Corporation). Iwaki Glass has for many years set the pace with innovative specialty glass products, especially heat resistance glass as its core business. On January 1, 1999 Iwaki merged with Toshiba Glass, one of leading glass manufacturers, to form Asahi Techno Glass (ATG). Maker of headlight glass, bulbs, electronic and industrial glass materials, cookware, and ceramics.

On search lights almost nothing can be found. Probably because there are no collectors neither museums which saved them. One can find an American site on which the world's very first search light (1925) is presented, although Iwaki Glass Seizo-sho made one already in 1885. Unfortunately I haven't been able to find them all.

On the internet you can read ATG history. But they forgot that a part of them in 1917 merged to Nippon Kogaku K.K.:
http://www.atgc.co.jp/gaiyo/hebin/he10006.html

3. Tokyo Keiki Seisaku-sho

Tokyo Keiki Seisaku-sho, a metal factory, has been established in 1896 in Koishikawa, Tokyo as Japan's first measuring instrument manufacturing plant. It started with the production of pressure gauges, followed in 1901 by compasses, depth sounders, and other navigation instruments and equipment. Since 1913 the optical branch of this firm also produced 1,5 and 4,5 meter rangefinders for the navy. Only the optical department of Tokyo Keiki became part of Nippon Kogaku. Even today Tokyo

Keiki still exist. Since 1990 they are known as Tokimec. Nowadays they are producing: Marine Systems, Hydraulic Equipment, Fluid Measurement Equipment, Web Inspection System and RF (microwave) devices.

Yoshikatsu Wada was director of the optical branch of Tokyo Keiki Seisaku-sho in 1917. He became the first director of the new Nippon Kogaku Kogyo Kabushiki Kaisha.

On the internet you can read Tokkimec history. But they forgot that a part of them in 1917 merged to Nippon Kogaku K.K.:
http://www.tokimec.co.jp/english/whats/history.htm

4. Fujii Lens Seizo-sho

Mr. Ryuzo Fujii was an officer in the Imperial Japanese Navy and held a degree in mechanical engineering from Tokyo Institute of Technology . Assigned to study science in Europe, he spent three years in Germany studying optical design and lens fabrication. Ryuzo studied at the Jena University in Germany from 1898 till 1901. Ryuzo Fujii returned to Japan in 1901 and quit the navy in 1907 to start his company, the Fujii Lens Seizosho (factory). His younger brother Kozo joined the company.
Kohzo (or Mitsuzo) graduated from Tokyo Imperial University in applied chemistry, and became director and manager of the Aichi Cement Company.
In 1909 (In the Japanese Photo Industry 1958 it says: Production on an industrial scale started in 1907 with the establishment of the Fujii Lens Factory, which manufactured binoculars for the civilian market as well for use by the Imperial Japanese Navy (page 140)). Fujii Lens Seizo-sho opened a factory (after renting a dirt floor room in a residence, for research work) in Tokyo. In 1907 the two brothers started their own company, which they called Fujii Lens Factory. In March 1909, they created Japan's first modern optical plant in the Shiba district of Tokyo, which they equipped with German fabrication equipment and Zeiss measuring instruments. In 1909 Fujii Lens began repairing military products. The Fujii Brothers were the first binocular manufacturer in Japan, producing their first model with prism in 1911. This was the Fujii Brothers Victor 8x20 (The Fujii Bros. Victor No. 5x6 and a prewar Nippon Kogaku; Nikko Orion or Luscar binoculars have a lot of similarities.
See an Nekosan article at:
http://www.cameraguild.jp/nekosan/Nikonbino.htm

There is an picture and small article of this binoculars in NHS Nikon Journal 73, page 21 from Bob Thompson. This binocular was sold to the Imperial Navy. Galilean field glasses might also have been made. The Imperial Army and Navy placed enormous orders for telescopes and binoculars, with which one was able to measure exact distances. The WWI brought on difficulties in obtaining the German optical glass used in these early models, but production continued. 6x15 and 6x20 binoculars were exported to Russia and England.

I suppose that Ryuzo Fujii did not know that in 1909 the Japanese Army had established an optical research laboratory (See: 50 Years history of the Nikon Company, page 56. Gojunen no ayumi / 50-nenshi) in Tokyo, and in 1909 a repair facility was further established in order to service optical weapons belonging to the Japanese army. Combined with the experience gained in maintaining instruments such as field binoculars and cameras, the military facility also began producing telescopes and microscopes for a variety of applications like binoculars. This facility was secret and nobody should know about this. Fujii made the first telescope I know in 1913.

The Victor 8x20 by made by the Fujii Brothers in around 1911 was according Ryuzo Fujii himself the first prismatic binoculars made in Japan. This binocular was made after studying the models of prismatic binocular made by Andrew Ross and Co. (Britain) also Goerz (Germany). To make binoculars grinders and measuring instruments, glass materials were imported from Germany in those days. It is said that these binoculars had a feature to have fixed the prism on the back side of the upper and lower prism cover to wipe prisms easily when optics become hazy or mould grow. However the cleaning of these prism is difficult because prisms were fixed by bending edges of metal housing. Effective diameter of the objective lens is 20 mm and the apparent field of view is about 40 degrees. The manufacturer's serial number is not engraved. Prism covers are made of aluminum alloy. I wonder when these binoculars were sold in the market exactly and how many numbers were build. It is

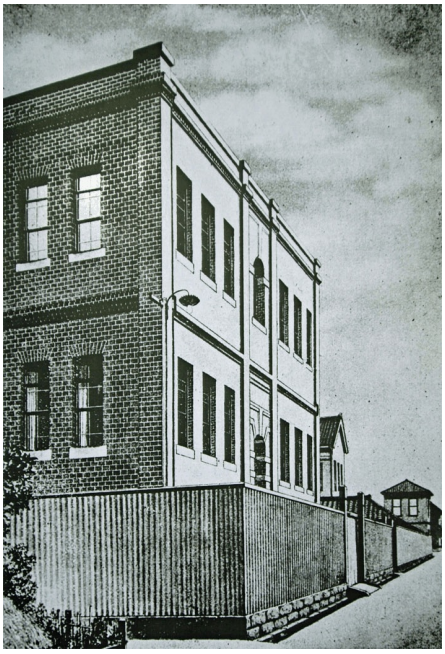
marvellous that Ryuzo and Kozo Fujii produced first Japanese prismatic binoculars after about 15 years Zeiss produced their first one.

Reference: "Kogaku Kaikoroku (Memory of Optics)" written by Ryuzo Fujii. Thanks for this addition: Tatsushi Nishioka. See his internet site: http://www.geocities.jp/ame0621/index.html
At http://www.geocities.jp/ame0621/oldbino1.html you can see a description of the Victor 8x20 binocular, with pictures. Even a Ross 6x30 binocular is described.

During the first year it performed optical research. As it happened, Fujii´s brother Kohzo, who had earned a degree in chemistry, became interested an soon left his job to join the new Fujii Lens Seizo Sho company. They had a new plant constructed in the spring of 1909 located on a lot nearly 13,000 square feet in Tokyo´s Toshima-ku section. It was a modern two-story building with an total work area of 1279 square feet. To equip their new plant they imported lens grinding and polishing equipment from Europe, and optical measuring instruments made by Carl Zeiss. The first floor featured the metal fabricating and rough lens grinding shop. The final assembly and repair shop, with the two lens polishing and one lens element rounding and centering machine, was located at the second floor.

During the first two years Fujii Lens Seizo-sho specialised in fixing imported optical instruments for the Japanese Army. In addition to Ryuzo´s training in Germany, the company gained much knowledge about construction methods and design foreign-made optical instruments. It is important to understand that at this time Fujii Lens did not have the equipment or skills necessary for the production of optical glass. Their emphasis was on grinding and polishing lens elements , as well as the fabrication of related metal parts. For projects requiring optical glass, Fujii Lens uses glass imported from Germany or made by the Japanese company Kato Kogaku located in Tokyo. In 1910 Fujii Lens designed and made prism binoculars which were placed on the market the following year. Produced in a test run, these binoculars had an 8x20 field and were called `Victor`. It is assumed that they were sold to the Japanese military.

There are indications that in the same year Fujii Lens Seizo-sho experimented with photographic lenses. As it is now understood, the company never actually manufactured any of these lenses. The probable reason for this was that the demand for domestic binoculars was greater than the need for photographic optics. In Japan at that time photography was not widespread, and besides, any Japanese made lens would have to compete with high quality lenses imported from Germany.
With the successful test run of Victor binoculars, both Fujii Brothers decided in 1912 to venture in the mass production of optical instruments. Their production of binoculars was to be increased, and they planned also to begin melting optical glass. Fujii got help from Tokyo Denki to melt optical flint glass. They started with recycling old lenses. The new glass shop was a direct result of the experience and knowledge gained by the company. To house these activities, a much larger second building was constructed.



First NK office in Bunkyo, Tokio, used between 1917 and 1918.

At 1917 the production of Fujii Lens Seizo-sho was about 150 telescopes and a 1000 binoculars every month.

In 1924 both Fujii brothers resigned from te management. Ryuzo Fujii wrote in 1942 a small booklet: "Kogaku Kaikoroku (Memory of Optics)" in which he describes his visits to Europe. It was a gift for the management at the Ohi plant.

5. Nippon Kogaku Kogyo Kabushiki Kaisha

The activity of the three factories covered fields such as measurement techniques, manufacturing of optical glasses and lenses, in fact three basic branches necessary to manufacture optical equipment. Having been founded in the late 19th century, the three companies had by then adequate manufacturing experience.

The newly consolidated company Nippon Kogaku Kogyo Kabushiki Kaisha started up with some 200 employees to

produce optical equipment. Most of these 200 were former employees of Fujii Lens Seizo-sho. It had to fulfil the optical needs of the Imperial Japanese Navy as well as the Army. Its first products were also used in the scientific and industrial world. By the time the Ohi plant (still being the main plant of the conglomerate) became fully operative in late 1918, World War I came to an end, but it did not changed the government's intention to establish an independent optical industry.

Yoshira Wada

Mister Yoshihara Wada was the first president. But Jeff Alexander says that: Kahei (or Yoshikatsu) Wada, the head of Tokyo Keiki Seisaku-sho, was selected during the incorporation to stand as the combined firm's first president.

It is not affordable to stop the production capacity of Fujii Lens Seizo-sho. The 200 employees, created a big production. And there was no import of German glass. So I suppose, most of the Fujii Lens Seizo-sho products were continued at the Fujii Lens Seizo-sho factory. The first products after December 1917 have no engravings at all. Later they became Joico or Nikko engravings. Together with Richard Lane (see his NHS Journal 82, Nippon Kogaku logos 1918 - 1945, page 6. article) I think that Nippon Kogaku started with optical research and production on a small scale first began in 1918. In 1921 the Fujii Lens Seizo-sho was closed and all production was from that moment localised in Ohi, south of Shinagawa, Tokio.

6. Military relations

The Washington Naval Conference of 1921 placed restrictions on capital ship tonnage thus depressing Japanese shipbuilding industry and therefore, adversely affecting affiliated munitions suppliers like Nippon Kogaku in their finances.

However, the Great Kanto earthquake of 1923, that had destroyed Nippon Kogaku's facilities, had also destroyed military and navy facilities, forcing vast resources to be assigned to new plant of Nippon Kogaku K.K., thus enhancing its relationship with the Imperial Japanese Navy as both a military supplier and as a research and design arm.

The London Naval Treaty was an agreement between the United Kingdom, Japan, France, Italy and the United States, signed on April 22, 1930, which regulated submarine warfare and limited military shipbuilding.

It was an extension of the conditions agreed in the Washington Naval Treaty and is officially termed the Treaty for the Limitation and Reduction of Naval Armament. It was a revival of the Geneva Naval Conference of 1927 which had been unable to reach agreement because of bad feeling between the British Government and that of the United States.

Terms of the London Naval Treaty resulted in acceleration of Japan's military research and development during the 1930s. While Nippon Kogaku benefited from increased naval construction, its product line now included photographic lenses. While not a camera manufacturer yet, it was providing lenses to camera companies like Canon with products like 75 mm, 105 mm, 120 mm, and 180 mm NIKKOR lenses. All Canon camera built before WWII were fitted with NIKKOR lenses.

The Imperial Japanese Navy asks Nikon to Develop Cameras. Nikon itself states that "... it was primarily in response to the demands of the navy that Nippon Kogaku took up camera research." London Naval Conference of 1930 and the Naval Supplementary Bill promoted the Japanese navy to try to reduce its dependence on France and it started asking Nippon Kogaku to design and manufacture cameras for reconnaissance air crafts. Soon the company was producing complex cameras for the navy.

Among the most technically demanding of projects done for the navy was the creation of optical rangefinders, or fire-control directors for capital vessels to be built in Japan. Nippon Kogaku's first

periscope was produced in 1918 and it improved during the 1930s. It also worked on lens coating problem during this period.

See for more detailed information the Jeff Alexander research in his article: Nikon and the sponsorship of Japan's optical industry by the Imperial Japanese Navy, 1917-1945:
http://grad.usask.ca/gateway/archive17.html
The Jeff Alexander article is great. If you don't read it, you can not understand the rest of my article.

7. Expanding

Nippon Kogaku expanded during the 1920s and 1930s. Military leaders saw expansion as the best way to attack the domestic problems of overpopulation and shortages of raw materials. The country looked to Southeast Asia as its natural extension, and in September 1940 Japan joined Germany and Italy in the Tripartite Pact to secure its interests in this area. As the threat of a major war increased, Japanese government planners chose to concentrate on improving precision optics for navigation and bombing equipment rather than radar and sonar technology, which was used by the U.S. armed forces. The decision meant new business for Nippon Kogaku and its competitor Minolta, both of which were primarily optical-equipment producers at the time. It also increased German technical aid to Japanese firms that were involved in the war effort, and Nippon Kogaku gained expertise through this arrangement.

8. The Ohi plant

Ohi plant in 2004 (photo author)

In 1918 Nippon Kogaku opened the Ohi factory in Shinagawa, south of Tokyo. In the same year Nippon Kogaku build an experimental glass melting furnace, which lead to the start of the production of optical glass. The research and design department nowadays still uses these premisses. In 1922 Nippon Kogaku bought a Naxos-Union optical grinder in Germany. Nippon Kogaku K.K. established a glass research facility on the same Ohi premises in 1923. It also built a glass melting furnace with a capacity of 350 kilo, followed by a glass melting furnace with a capacity of 500 kilo in 1927. In 1920 a BOA tester, a device to test the axle of a cannon barrel was made. In 1924 Nippon Kogaku K.K. built and installed a concussion machine for testing, with forces up to 10 G. The first successful experiments with melting with the use of electricity were performed in 1930. In the basement of the factory No. 1 a deep freezer was installed in 1935.

After the Kanto earthquake, the Ohi factory was out of business for 17 days. Nobody of the personnel died. But no water, and no electricity stopped the activities at the plant. And the Navy researchers from the Tsukiji Arsenal were moved to Ohi. So that makes that all optical engineers and technicians in the civilian and military sectors worked now on one spot.

	Corporation capital	number of employees
1917	2.000.000	200
1921	4.000.000	600
1923		900

On my first trip to Wetzlar Germany in 2006, I saw the old Leica Plant. Its nearly the same English Industrial type building as the old Nikon Ohi building. The Ohi building was demolished in 2007.

9. European contacts

Ryuzo Fujii (former Fujii Lens president and now Nippon Kogaku Board Member) travelled in 1918 to Europe, mainly to Germany. He had contacts with Carl Zeiss Jena and the glass factory of the Schott Brothers, also in Jena. To form a joint venture with Carl Zeiss wasn't a success, although even today Nikon Corporation is still buying Schott glass. According to some sources Nikon Corporation tried twice in its history to buy the Schott company.

In 1921, eight German scientists & engineers were hired by Nippon Kogaku K.K. for five years:

Heinrich Acht, (the principal engineer) product design and drafting, microscope design;
Ernst Bernick, engineer for precession instruments and mechanical engineering;
Hermann Dillmann, specialist in lens design and measurement, optical computing;
Dr. Max Lange (25-04-1883 - 1923), optical lens design;
Albert Ruppert, prism grinding and polishing
Adolf Sadtler, lens grinding and polishing;
Otto Stange, product design and drafting and
Kurt Weise, lens grinding and polishing.

On other places I found other names: for example Max Lang and Karl Weise.

Former Leica plant in Wetzlar Germany, 2006, there are some similarity with the 1918 Ohi plant. (photo author)

Max Lange (Kanto earthquake) and Adolf Sadtler died in Japan, five others went back to Germany in 1926, but Heinrich Acht stayed in Japan until 1928. The Germans did an efficient job in different fields ranging from organisation to optical design. Heinrich Acht extended his contract for another three year period and he was in charge of managing optical design until the end of his stay.

Ohi plant in 1996 (photo author)

In those days there was in fact just one very good optical firm in the world: Carl Zeiss (including Schott) from Germany. Its difficult to find out where these eight German engineers worked before they came to Japan. They received their invitations in 1919, which is one year after the World War I and at that time Germany was facing a high unemployment rate. Two of these Germans should have been employed by Goertz in Berlin. And Heinrich Acht was known as a microscope specialist
There is no personal record of these 8 gentlemen. Because two of them died in Japan and the others went back rather quickly most of them might have been older than 50 or 60.
As we can read in several books of Nippon Kogaku's history (50 & 75 Years) and other documents Nippon Kogaku was and is still very proud of its German engineers. This proud may lead to the assumption that the Germans might have been former employees of Carl Zeiss, as one isn't proud to employ some unemployed German engineers but one will be proud to steel them from the horses mouth. There are two other sources:
"I know Zeiss sent a team out to Nippon Kogaku in the 1920s": Stephen Sambrook in an e mail list on the subject of binoculars, by Peter Abrahams.

"It is interesting to consider if N.K. obtained the production rights (or license) from Zeiss to produce this artillery telescope in the early 1920s": Richard Lane: NHS Journal 82 page 7.
But sorry for Zeiss, 2 of the 8 worked for Goertz, Berlin. Which 2?? And were worked the others before they went to Japan??
About Max Lange someone told me that he was an employee of the Goertz factory in Berlin. He liked the play GO and there is an article in which his work is mentioned: *Ein zweiter Dr. Max Lange : Go-Spiel geistreicher als Schach / von Peter Gütler. - Kaissiber, 2000. - Nr. 13, Januar-März, p. 53-57.*

Nippon Kogaku has built a barrack for the accommodation of German employees. This on the site of the factory in Ohi. An elongated barrack, with one and more person rooms, a dining room, sanitary facilities, etc. In the archives of Nikon I have seen a map.

One of the first tasks for the group was redesigning Nippon Kogaku binoculars, resulting in the Luscar, Mikron and Atom models of 1921. The German group also helped Nippon Kogaku in 1921/22 to design and produce some refractor type telescopes, like the 5 centimeter, 10 centimeter and an 50 centimeter reflector models, for astronomical use. In 1922 they constructed another telescope with an 50 centimeter mirror. The German team also assisted in the production of photographic lenses. The first was an 50 centimeter anastigmatic triplet lens.
In that same period, Kakuya Sunayama started up as a engineer for optical items. With help of the German team he became the most promising candidate for the optical design department.

Heinrich Acht went back home to Germany by a steamboat called "Atsuta maru" on 27 February 1928, 11:00 a.m. departing from Yokohama. Kakuya Sunayama, went for Europe as a member of Japanese Naval mission on next day (28 February 1928) by railway (from Tokyo, through Korea, Manchuria and Siberian railway). And in this trip, Sunayama visit Leitz Wetzlar late July of 1928 and looked the microscopes in the display room of Leitz. Kakuya Sunayama visited for a period of 8 months several optical industries in Germany, France, England and the Netherlands.

After his return to Japan Mr. Sunayama became head of the commercial photographical lenses design department.

12,5 cm f4,5 1929

In 1929 Sunayama designed and improved a 50 centimeter f/4.8 aerial lens, called the Trimar, and a first experimental version of the 12 centimeter f/4.5 Tessar type for 6.5x9 plate cameras, called Anytar.

10. Co-operation with Canon

Goro Yoshida (1900-1993) was one of the two founders of Seiki Kogaku Kenkyusho in 1933. Mr. Yoshida was the first person to turn his attention to the production of Japanese small precision cameras. Despite of several Leitz patented ideas, Mr. Yoshida had various ideas in order to develop new focal distance adjusting mechanism. The first idea was a camera with an attached rangefinder with registration number 220536. In November 1936 Yoshida registered more ideas: 230748; for a device on a camera that adjust the position of the object lens according to the shooting distance. 245135; a device on a camera that adjust the object lens automatically to the shooting distance. 254037; a device that adjust freely the ratio of the rangefinder movement and the ratio of the focussing movement of the lens in the middle of the coupling section. These last three ideas were made in a period that Yoshida already left Seiki Kogaku. His ideas were not used by Seiki Kogaku.

The other founder of Seiki Kogaku was Saburo Uchida. They were soon joined by Takeo Maeda and they produced the prototype Kwanon 35 millimeter camera in 1934. Also in 1934 Saburo Uchida consulted his older brother Ryonosuke Uchida, about getting hold of high performance lenses for small precision cameras and solving the problem of focus adjustment mechanism. Ryonosuke, a graduate of the Naval Academy at Edajima, had been a navy officer and was an expert on gunnery. When he was making fuses for shells at Nippon Kogaku, he was the supervisor in that division at the Ohi factory. He recommended that Uchida seek assistance from Nippon Kogaku on this matter. By the end of the summer in 1934, Uchida, together with Maeda Takeo, visited Nippon Kogaku. They took with them the prototype Kwanon camera in a nice silver box. At Nippon Kogaku, Shigeji Yamamoto, the sales section

manager, and Noboru Hamashima, the chief of the civilian supplies, received the Uchida party. Later Sunayama, the design division director, joined the meeting. Uchida asked for co-operation and Sunayama agreed. Sunayama must have been eager to give full support to the realisation of the first Japanese 35 millimeter camera, which Seiki Kogaku was about to perfect. Sunayama had been pouring his passion into developing lenses for 35 millimeter cameras. The Nippon Kogaku lens that had no prospect of selling, finally found a marketing channel. *Extracted from The Nikon story from T. Arakawa, translated in NHS Nikon Journal 47.*

Nippon Kogaku agreed to co-operate with the company which was later named Canon. It designed and manufactured coupled rangefinder mechanism, which were mounted in cameras. Those cameras were already fitted with shutters, so Nippon Kogaku in fact did the finishing touch. Nippon Kogaku had already succeeded in designing and manufacturing 35 millimeter camera lenses, and thus, by installing its lens, was able to complete the camera that Yoshida had dreamed about.

In Arakawa's Forty Years there is a remark saying that with support from our company, Seiki Kogaku was founded in November, 1933. After a considerable struggle it succeeded in manufacturing a small camera. *See Arakawa; The founding, chapter 2.*
Eiichi Yamanaka, who entered Nippon Kogaku in 1931 and who worked in the civilian supplies design department, was given the task to design the focus adjustment mechanism. This marked the beginning of Nippon Kogaku's involvement in of 35 millimeter cameras mechanism.

Yamanaka's idea brought about the unique focus adjustment mechanism that distinguishes the Hansa Canon camera. The application for a patent on this invention was submitted on June 27, 1935, in the name of a device which adjusts the position of the object lens in a camera to accommodate the shooting distance. The inventor was Eiichi Yamakana, the applicant was Nippon Kogaku, and the registration number was 229211".

Nippon Kogaku, at that time, had already established its position as the largest optical equipment manufacturer in Japan with advanced manufacturing system specializing in military equipment. Since Saburo Uchida's brother, Ryonosuke Uchida, was once an auditor at Nippon Kogaku, Saburo Uchida was introduced to Toyotaro Hori, the executive vice president and the counsel of Nippon Kogaku. Those days, under Nippon Kogaku's policy to enter the civilian product market, Hori was in charge of studying non-military products. He was interested in the application of high-grade lenses for civilian use. The timing of the request for co-operation by Precision Optical Instruments Laboratory was perfect. Recognizing benefits on both sides, Precision Optical Instruments Laboratory and Nippon Kogaku came to an agreement to develop the "Hansa Canon (Standard Model with NIKKOR 50 millimeter f/3.5 lens)" with the full support of Nippon Kogaku. The first Canon camera under this joint development was introduced to the market in February l936 (although some have said that the actual date was October l935). In manufacturing the "Hansa Canon," Nippon Kogaku was responsible for the lens, the lens mount, the optical system of viewfinder and the rangefinder mechanism, while Precision Optical Instruments Laboratory was responsible for the main body including the focal-plane-shutter, the rangefinder cover as well as the assembly of the camera body. The "Hansa Canon (Standard Model)," became Canon's first commercial camera. Later, the name of the "Kwanon" changed to "Canon".
See Canon article:
http://www.canon.com/about/history/index.html and click on Prologue up to the birth of Canon.

The Hansa Canon, a Japanese 35mm viewfinder type camera, was created by dismantling and studying the German made Leica III from 1933.

Why would Canon choose a lens made by its rival for their first camera? The simple fact is that half a century ago Canon and Nikon weren't rivals. Back then, it took both companies to produce a quality camera. So the lenses produced by Nippon Kogaku K.K. were the first lenses (made in Japan) ever capable of replacing high quality foreign-made lenses. Although the know-how and the technological aspect of the lens design came from Europe. A legacy of lens-making technology left by Heinrich Acht, an engineer who came to Nikon from Germany in the 1920s - which enabled Kakuya Sunayama, the head of Nikon' s Design Departments to attempt to develop a camera lens. After innumerable trials, Mr. Sunayama finally succeeded in creating a high quality lens in 1932. See: Canon Lens Serial Numbers in British Photographic World Magazine, May 2003.

When in 1935 Seiki Kogaku started manufacturing their own cameras, Nippon Kogaku began supplying them with finished optical lenses in metal tubes. Seiki Kogaku placed these tubes into lens mounts ready for mounting onto the required cameras. Early in 1939. Seiki Kogaku purchased 2 lens generators, 5 lens polishing machines and an lens checker or Vertometer. Mr Ryozo Furukawa, a lens designer was transferred to Seiki Kogaku from Nippon Kogaku. Mr. Furukawa's job was to help set up these optical machines in the Nakane-cho Meguru factory. He had previously worked at Nippon Kogaku under Mr. Kakuya Sunayama, their chief lens designer. See:
http://www.mir.com.my/rb/photography/companies/nikon/htmls/nikon_canon.htm

Robert Rotoloni mentions in his article: Who made what? in NHS Nikon Journal 79, March 2003, page 1, 2 and 3, that he thinks that Nippon Kogaku also provided Seiki Kogaku with lenses after 1947. The common 5 centimeter f/3.5 NIKKOR on most of the Canon S-II body's before 1947 are similar with the later 5 centimeter f/3.5 Serenar on Canon S-II body's between 1947 and 1949.

The first lens for a 35 millimeter film format camera, a 5 centimeter f/3.5 - was produced in July 1935 by Nippon Kogaku, and built in the Hansa Canon camera. Somewhat later a 5 centimeter f/4.5 was produced.

In August 1937 a 5 centimeter f/2 NIKKOR lens, and later in January 1939 a 5 centimeter f/1.5 NIKKOR lens were produced for the Canon cameras.

There is an nice article about the earliest NIKKORs from Hayato Ueyama in NHS Journal 22.

In 1939 Seiki Kogaku made its first lens, an 50 millimeter f/1.5 Seiki Serenar for an X-ray camera. Then in 1940 Seiki Kogaku made an 75 millimeter f/4.5 lens for military purpose.

Between 1996 and 2005 the Canon Corporation says on their web site that the Serenar 35 millimeter f/3.5 (1950) was the first photographical lens they made. Nowadays they say that they started lens production in 1939. See:
http://www.canon.com/about/history/index.html and click on 1937-1945.

"Before joining Seiki Kogaku in 1939, Ryozo Furukawa worked under the head lens designer at Nippon Kogaku, Mr. Kakuya Sunayama. During this period of time, the 5 centimeter f/3.5 NIKKOR was designed for the Kwanon, which was renamed the Hansa Canon camera. In June 1934 Seiki Kogaku presented Nippon Kogaku with an German 5 centimeter f/3.5 Elmar lens, which was examined by Sunayama. The first 5 centimeter f/3.5 was completed in December 1934. Made entirely from glass melted at Nippon Kogaku, it was patterned after the Zeiss Tessar. In January 1935, Furukawa checked the performance of the then new 5 centimeter NIKKOR against that of the 5 centimeter Elmar and found the performance of the German optic to be better than that of the new NIKKOR lens. This comparison came as a surprise to Sunayama and Furukawa, since they believed that their NIKKOR was the world's number one copy of the original Zeiss Tessar lens. This situation was complicated even more by the fact that the Tessar-based Elmar was the product of a much smaller company: Ernst Leitz from Wetzlar. Subsequent improvements in optical glass allowed this situation to be corrected in May 1937, when Nippon Kogaku improved the performance of its 5 centimeter f/3.5 NIKKOR. It has been thought that because Sunayama was really never satisfied with the optical performance of the original 5 centimeter f/3.5 NIKKOR, he went on to design the sharp 5 centimeter f/4.5 NIKKOR. Not introduced until 1939, this lens and its companion 5 centimeter f/2.8 NIKKOR were designed during 1935-36 before the performance of the 5 centimeter f/3.5 was improved as a sharper alternative."
From John Baird: "What If", a reading paper for the NHS 4 Convention Utrecht, Netherlands in 1994.

	Capital x 10.000 Yen	
	Nippon Kogaku K.K.	Seiki optical laboratory
1937	500	100
1938	500	100
1939	500	100
1940	1000	100
1941	2500	100
1942	5000	100
1943	5000	100

1944	5000	175
1937	437	12
1938	503	53
1939	730	19
1940	901	22
1941	1305	90
1942	1485	123
1943	2686	198
1944	4820	368

I am not a fan of Canon. That's sure. On of the reason is that they several times change their own history story's on the internet. Before 1996 they neglected the cooperation with Nippon Kogaku. After publication of the books from Arakawa-san, they mention that Nippon Kogaku helped them several times. And nowadays (March 30, 2006) you can read:

"1934 Prototype-version "Kwanon", Japan's First 35mm Focal-Plane Shutter Camera.
Having set up the Precision Optical Instruments Laboratory, Yoshida devoted himself to making cameras. He faced many significant obstacles, because not only making exact replicas of Leica and Contax cameras, two major brands on the market at the time, which was difficult with the technique at the time, he strove to incorporate original ideas into the mechanical workings of cameras.
Since the laboratory was not a factory, all parts were sourced externally."

11. Names and logos

"Nippon Kogaku" was the earlier name used on most Nikon products. This name was used between 1917 and 1988. Nippon Kogaku means Japan Optical.

Picture from name plate old Shiba factory

In 1917 there was, except of the Fujii Brothers binocular production, no production at all. The Fujii Brothers binoculars were renamed to JOICO. JOICO is a trademark made up of the initial letters of the Japan Optical Industry Co., which is a literal translation of Nippon Kogaku K. K., the company's name at the time. (http://www.nikon.com/about/feelnikon/recollections/r06_e/index.htm) The JOICO name was also used for the first microscope in 1925.

Between 1935 and 1949 Nippon Kogaku used the name and logo "NIKKO". But the first series Nikko binoculars get in 1922 on the market.

1930 microscopes also use new trademark - Nikko.

1932 NIKKOR selected as trademark for lenses.

1946 Nikon brand name chosen for small-sized cameras.

In 1959 the company changed the brand name on binoculars from Mikron to Nikon (according Nikon Corp).

In mid-1969 the company decided to modernized and go with simply the word "Nikon". But even after this date they used older "Nippon Kogaku" inscribed plates from old stock.

1988 Nippon Kogaku K.K. Corporate name changed to Nikon Corporation.

Some used logo's:

日本光學
NIKKO

日本光学
NIKKO

NIPPON
KOGAKU
TOKYO

日本光学

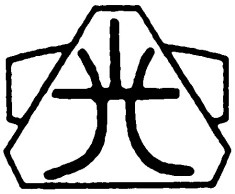
Logo used between March + August 1945

Logo on artillery optics around 1930

Logo for the Navy

Logo for the Navy

Logo on Aero NIKKOR 50cm, same as the Nikko logo



Logo 1930 - 1936

株式会社 ニコン

NIKON CORPORATION

Logo 1988

6. Pre-war and war production

Lens coatings

Both Bausch and Lomb in the U.S. and Carl Zeiss Jena in Germany developed a process for lens coating almost simultaneously in 1935. By 1939, Zeiss was successful in multi-coating their optics with a double layer and by 1942 using a triple layer coating. Before coatings, binocular manufacturers like Ross of London and Zeiss sometimes designed the rear eyepiece element in the binocular in such a fashion that it could be cemented directly to the binocular's prism face, thereby increasing light transmission about 8%.

1. Periscopes and first lens coatings

The very first submarine periscope, Model I, with a focal length of 7 meter, was produced in 1919; it has a magnification of 1.5x or 4.5x. The second model (also 7 meter and using aspherical lenses) of 1921 has a magnification of 1.5x and 6x.

Nippon Kogaku's first periscope was produced in 1918, and had an overall length of 7 meter and 49 centimeter. Following the First World War, the company began to produce periscopes based upon German designs, manufacturing between 50 and 60 units between 1920 and 1922. By the mid 1920s, German technicians were hired by the company to aid in the development of new models, and records indicate that by the beginning of the Showa period, large numbers of 9 meter and 10 meter periscopes were being produced. Nippon Kogaku was also called upon to make working periscopes for the over 300 midget submarines that were produced across their various classes. See: Hansgeorg Jentschura, Dieter Jung and Peter Mickel, Warships of the Imperial Japanese Navy, 1869B1945, Antony Preston and J.D. Brown (Trans.) (Annapolis, MD: Naval Institute Press, 1977), p. 184 -185.

Added to the optical engineering of the periscopes themselves was an ongoing effort made by Nippon Kogaku to increase the transparency of their glass surfaces. The standard 10 meter periscope produced by the company featured 33 individual optical elements and its complexity resulted in dramatic light losses. See: Howe, p. 306. In the interest of maintaining their strategic advantage, Japanese submarine commanders wished to use their periscopes at dawn and in the low light of early evening, but the initial inferiority of the optics prevented them from doing so without difficulty. These commanders placed great pressure on the navy and on Nippon Kogaku to improve the performance of their periscopes under low light conditions, and the company responded by initiating research into new lens coating techniques aimed at increasing their transparency.

According to the US naval investigators, the company had developed two methods for coating glass surfaces; ‘a chemical method, in which the glass was treated with nitric acid'; and an ‘evaporation method, in which cryolite is evaporated and deposited upon the glass surface'. See: ‘Japanese Optics', in US Naval Technical Mission to Japan, p. 31. These procedures were evidently conducted at the Nippon Kogaku's optical factory at Yokosuka, in coordination with the navy's submarine base at Nagura Harbour. During their analysis of the plant, the US Navy investigators noted:

‘Evidence was found that lens coatings had been carried on', and recorded that ‘a few samples of apparently experimental coatings and coating material were obtained'.

Such experimental work demonstrated the kinds of subsidiary technologies generated by the company's efforts to deliver on Imperial Japanese Navy optical contracts. Efforts made in the field of experimental periscope lens coatings would be of particular importance in the postwar period as such coatings were later found to have a variety of applications in photographic lens design. Periscope production also continued after the war, and Nikon manufactured instruments for construction surveying, as well as a series of 10 meter periscopes for use in the railcar bays of the shinkansen, or bullet train railway line. See: Nippon Kogaku Kogyo Kabushiki Kaisha: gojunen no ayumi, / 50-nenshi, p. 180.

The decision had been made to manufacture periscopes that were even shorter than the shortest model at that time (1945) it was type #97 and rumour had it that they were for human torpedos Kaiten. There is an entry on this short periscope in Nippon Kogaku: The history of 40 years, page 481

"In May 1945, we were asked to manufacture immediately a periscope with the span of about 1 meter, which we guessed would be fitted to a torpedo. This was a single magnification device and had the company nickname of S5 Metalware. The plan was to design the product in the Naval Optical Experiment Division, to manufacture the glass portion at Toyokawa Navy Arsenal and the metal portion at our company. We were to manufacture 130 of them immediately". From Arakawa: The name is Nikon: NHS Journal 72, 2001, page 12-15.

Nippon Kogaku also made several trench periscopes (binoculars), so you could look to the enemy, without being hit by bullets.

In 1939 Nippon Kogaku introduced vacuum damping of lens coatings to eliminate internal reflections in lenses. But one year earlier, with the production of searchlights, Nippon Kogaku used an anti condensation coating. Fogging of lenses is a big problem, and an anti condensation coating could help.

2. Rangefinders

With the increasing demands being made by the military for optical devices capable of seeing extreme distances or in specific dimensions, Nippon Kogaku's research was also directed toward the development of adequate gun cameras, bomb-sights, wide-angle lenses, and even infrared imaging devices. Among the most technically demanding of these projects was the creation of optical rangefinders, or fire-control directors for the first Imperial Japanese Navy capital vessels to be built in Japan. In an era before computer-enhanced imaging systems, assessing the range to a target required warships to employ a variety of purely optical instruments. These devices produced a stereo optical image of a target for a vessel's fire-control command centre, which together with corrections for the target's course and speed would enable the shagekiban, or fire-control computer, to calculate accurate gun-sight values for the turret.See: David C. Evans and Mark R. Peattie, Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887B1941 (Annapolis, MD: Naval Institute Press, 1997), p. 253. As the various instruments grew in scale, so too did their individual optical components, or 'elements', such as lenses and prisms. Larger and more ambitious element designs, in turn, fuelled the proportional expansion of the firm's production facilities and equipment.

Following the arrival of the British-made battle cruiser Kongo in 1913, which featured rangefinders produced by maker Barr & Stroud, the Imperial Japanese Navy began to design comparable fire-control optics for future vessels. See: Nippon Kogaku Kgyo Kabushiki Kaisha: gojunen no ayumi, p. 179. (50 Years history).

Kongo was the last of the Imperial Japanese Navy's capital ships to be built outside Japan, and during its construction by Vickers & Sons, a series of three sister keels was laid in Japanese naval yards at Yokosuka, Nagasaki, and Kobe. See Hansgeorg Jentschura, Dieter Jung and Peter Mickel, Warships of the Imperial Japanese Navy, 1869B1945, Antony Preston and J.D. Brown (Trans.) (Annapolis, MD: Naval Institute Press, 1977), p. 35.

Over the next 10 years, Imperial Japanese Navy optical researchers at the Tsukiji Arsenal made considerable progress in the field of optical engineering, but their efforts were reduced to ashes in the earthquake and fire of 1923. From this point forward, the Imperial Japanese Navy came to rely on private domestic manufacturers for the satisfaction of its optical requirements, not the least of which included rangefinders. The optical fire-control contracts awarded to Nippon Kogaku by the Imperial Japanese Navy would stretch the company's technical capabilities to their limits and necessitate the expansion of its research team to include a wider cast of experts in the field of optics. The largest of the high-angle directors were produced especially for the Yamato class of super-battle-ships, plans for which were drawn up after the failure of the second London Naval Limitation Conference in 1936. Each of these 70,000 ton vessels was designed to feature three 18.1 inch turrets, and represented the firm determination of the Imperial Japanese Navy to outrange all other navies. Superlative artillery, however, also necessitated superlative fire-control optics, and Nippon Kogaku was therefore tasked with the production of eight 15 meter rangefinders capable of providing images of targets at distances of over 35 kilometer. See: Evans and Peattie, p. 262.

One of the finished devices were affixed to each of the three main turrets aboard both the Yamato and the Musashi battleships, with a fourth installed on their forward fire-control towers. The creation of these massive instruments involved such a high degree of engineering precision that the standard of accuracy in their prism construction was 60 times greater than that which had been applied to conventional projects. See Howe, p. 305.

Nippon Kogaku had not only set new design standards when it had furnished the Imperial Japanese Navy's flagship Yamato with the optics necessary to fight, it had also raised the technological capability of the Japanese optical industry as a whole`. See the Jeff Alexander article.

The 15 meter rangefinder (93 model) and the shagekiban fire-control unit were installed on the Yamato in 1941.

Scale modell of the Yamato in the Yamato Museum in Kure, Japan

The first penta prisms for rangefinders were made in 1927.

3. Technologies gained on working for the Yamato class ships

The Yamato, lead ship of a class of two battleships, was built in 1940 at Kure, Japan. She and her sister Musashi were by far the largest battleships ever built by the Imperial Japanese Navy. The WWII Japanese super-battleships Yamato and Masashi were each 72,000 tons, twice the size of the biggest US battleships (Iowa class 35,000 tons). They were 50% heavier than anything the US had. And they were fast. Quadruple steam turbines of 150,000 shaft horsepower drove these ships at almost 30 knots. They carried the heaviest ship armor ever known. They simply dwarfed the US warships of the day! (In comparison the German Bismarck was 50,000 tons). Build by Mitsubishi in Nagasaki. Equipped with nine 460 millimeter (18.1-inch) main battery guns, which fired 1,460 kg (3,200 pound) armour piercing shells. Speed: over 30 knots. Range: 8,000 nautical miles, nearly 15 kilometer. The third Yamato class ship was converted into an aircraft carrier: the Shinano. As a carrier she was to carry 20 fighters, 20 bombers and 7 scouts. All mentioned ships were sunk during WW II. The Yamato sunk in 1944.

After the war, the American troops in Japan made a small list of optical and precision equipment used on the Yamato and the Musashi. In most cases: made by Nippon Kogaku.

YM108 Low Angle Director and 15 m Rangefinder 1 per ship
YM109 Low Angle Director and 10 m Rangefinder 1 per ship
YM110 4-5 m Rangefinder Type 94 HA/F/Control 1 per ship
YM113 Searchlight 150 centimeter 4 per ship
YM114 Signal Lamp 60 centimeter 2 per ship
YM115 Daylight Signal Lantern 2 per ship
YM128 4.5 m Rangefinder 1 per ship
YM133 1.5 m Rangefinder 2 per ship
YM101/135 Complete Set Precision Control Fittings. See the first Jeff Alexander article, and 'Japanese Optics', in US Naval Technical Mission to Japan.

In a catalogue, dated 1942, of the Ministry of Industry, 22 different precision instruments of Nippon Kogaku are listed.

4. High precision mechanical devices

I'm not sure when Nippon Kogaku made its first sights and view finders. I have found the following models.

In 1934 there is a model 93 "shahoban no. 1". It combines a rangefinder and a gun or cannon. But in 1932 Nippon Kogaku also built two model 93 binoculars; a 4x40 and a 6x40 with 6.5? for use on a cannon called "Kanimegane". Even earlier, in 1923, there is an rangefinder, binocular type with 50 degrees 10x50, sold to the Navy.

In 1925 a 6x18 binocular for aiming a cannon; in 1929 a 7x model 89 binocular for the Army; in 1931 a model 91 binocular 15x75, periscope style 45 centimeter and with a 60? field of vision. With 45 centimeter it is a very wide (almost rangefinder alike) binocular. If these 89, 91, 93 models make aiming possible, one can call them a sight.

A translation of pages 111 - 116 of the 'Nikon 75 Years History' book only would not be sufficient. In my listings I'll just mention binoculars and rangefinders, but if I read the specifications these early versions may have a link to sights and other fire-control devices.

5. Binoculars

See for more info my homepage:
http://www.hansbraakhuis.nl/

6. Telescopes

In 1922 Nippon Kogaku presented at the Peace Memorial Exposition in Tokyo a 20 Inch (50 cm) Casse grain-type telescope (reflecting) for the research of celestial bodies. This was a civilian product, as earlier considerably smaller telescopes (sized 1, 2 and 3 inches) of Tokyo Keiki and Nippon Kogaku were produced for military purpose. Also in 1922 Nippon Kogaku made two 4 and 6 inches astronomical telescopes.
A 20cm telescope was made by Nippon Kogaku K.K. and supplied in 1931 to the Ueno National Science Museum. There is a drawing named "Women looking up stars".

"*About a painting about a telescope and women:*
It is well known here and it was once used as a design of post-stamp. It was painted in 1936 by a painter called Cho-u Oota (1896 -1958). It is owned by the National Modern Art Museum in Tokyo (273x206 cm). As you see the telescope is realistic. It was drawn based on a real sketch of the famous 20 cm refractor of the National Science Museum at Ueno in Tokyo which was built in 1931. The refractor was made by Nikon (Nippon Kogaku) and is still working (once overhaulled).
Sadao MURAYAMA (1924 -), now retired, worked for a long time for the Museum and it was by the 20 cm refractor that the young pair of MURAYAMA and EBISAWA detected the 1956 great dust disturbance on 20 August 1956 and took the Tri-X pictures of the dust storm. (Mn)"
From http://homepage2.nifty.com/~cmomn2/282WSh.htm
And see for the stamp: http://www.hps.hokudai.ac.jp/hsci/stamps/1877a-e.htm
See the painting at: http://home.europa.com/~telscope/otachou.jpg

7. Lenses

Nippon Kogaku Kogyo K.K. hires eight German engineers and scientists on a 5-year contract. They worked on optical design, product design, and lens and prism grinding and polishing. One of them, Heinrich Acht, extended his stay until 1928. He produced samples of photographic lenses, the first ones to come from Nippon Kogaku. Kakuno Sunayama took over lens design after Acht and improved upon Acht's 50 centimeter f/4.8 lens in 1929, calling it "Trimar." In the same year, he later produced the "Anytar" 12 centimeter f/4.5 lens based on the Carl Zeiss Tessar lens.

In 1929 Nippon Kogaku made several "Anytar" and "Tessar" type lenses. They were from 7.5 to 18 centimeter in length. These lenses were probably the first made for civilian consumers. Probably only the 12 centimeter type sold with a fabulous number of 20 pieces to the Konishi-Honten Rokuohsha factory for their "Lily Hand Camera". Al the others types remained unsold. Probably Nippon Kogaku assembled the lens at the Lily Hand Camera, as at that time there was no bayonet. The Lily Hand Camera, fitted with a Compur shutter, takes 6,5x9 centimeter glass negatives. With this camera Nippon Kogaku studied its possibilities to bring an own camera to the market.

With the debut of its 75 millimeter (Tessar-type) f/4.5, 105 millimeter, f/4.5, 120 millimeter, f/4.5 and 180 millimeter, f/4.5 NIKKOR lenses in 1933, Nippon Kogaku started with the supply other Japanese optical manufacturing firms with the lenses needed to produce cameras. This is also the first time that Nippon Kogaku used the NIKKOR name for lenses.

In 1937 Nippon Kogaku made a whole range of 50 millimeter lenses for the 35 millimeter film format. The apertures ranged from f/2.0 and f/4.5. And, as stated earlier, there was the order from the "Seiki Kogaku Precision Optical Research Institute in Roppongi-Tokyo" for their first "Hansa Canon" camera. The f/3.5 five centimeter lens was developed by mister Kakuya Sunayama from Nippon Kogaku. His colleague mister Eiichi Yamanaka developed for this Hansa Canon bayonet catch. Until 1948 Nippon Kogaku made all 5 centimeter lenses for the Canon-S, Canon-J, Canon-JS and the Canon-S2.

In 1937 Nippon Kogaku made their first 55 millimeter enlarging lens. This lens got the name "Hermes". In 1948 the second enlarging lens was made: the EL NIKKOR 5 centimeter f/3.5.

If your looking for the originals, the lenses NK used to make their copies, look for the Dopp.-Anastigmat. Dagor 6.8 F=168mm. C.P.GOERZ and others. Goerz Germany made these lenses between 1918 and 1926.

8. Cameras

The first camera from Nippon Kogaku everybody knows is the Nikon Camera (type I), a 35 millimeter rangefinder camera. And we all know that after WWII Nippon Kogaku also had plans to make an 6x6 camera. A blue print design of this camera can be found all over the internet. We also know now that Nippon Kogaku worked around 1936 at the Hansa Canon camera and probably at the Canon Jr around 1939. We also know now that Nippon Kogaku worked on the Lily Hand Camera in 1929.

Of primary importance to Nikon's postwar development is the company's initial interest in the design and manufacture of cameras. It must be noted, however, that Nippon Kogaku was initially founded as an optical firm, and not as a camera manufacturer.

Until the 1930s, its production line was limited to telescopes, microscopes, surveying equipment, and a variety of optical measuring devices of use to science and industry. See: ‘A Short History of Nippon Kogaku Japan', in Nikon Historical Society Journal.
As noted above, the company's research into photographic lens production was largely an effort to duplicate existing German designs and to become a supplier of lenses to camera manufacturers. With the advent of the London Naval Conference of 1930 and the Naval Supplementary Bill of the same year, however, the navy began to put pressure on Nippon Kogaku to begin designing cameras for reconnaissance aircraft. According to the company's own history, the Imperial Japanese Navy had theretofore depended entirely upon the import of aerial reconnaissance photographic equipment from France. See: Nippon Kogaku Kogyo Kabushiki Kaisha: gojunen no ayumi, p. 67. (50 Years history)
After 1930, the company's researchers were encouraged to develop a series of simple prototype cameras to satisfy the navy's demands for increased self-sufficiency in the field of aerial photography. The first models ranged from 700 millimeter to 1200 millimeter in focal length and were characterized as simple, unsophisticated structures. Following this project Nippon Kogaku began to manufacture a range of artillery cameras for land use, a project that was its first foray into the production of photographic munitions. The significance of the company's early efforts in the field of camera manufacturing is rooted in the source of the incentive to pioneer such designs. Nikon states categorically ‘it was primarily in response to the demands of the navy that [Nippon Kogaku] took up camera research'. As a result, the seeds of the company's postwar design and manufacturing focus were sewn by the navy's plan to reduce its dependence upon foreign suppliers of vital photographic

equipment. This forced realignment of Nikon's manufacturing priorities would ultimately lay the foundations for its success in postwar camera production.

From these early efforts, Nippon Kogaku went on to produce a variety of increasingly sophisticated cameras for a wide range of military uses. After 1932, the designs had become ‘authentic, full scale' aerial and land-based cameras, and each constituted another level of technological achievement for the company in its efforts to meet the navy's demands. In the field of reconnaissance photography, the first small aerial camera to be mass-produced featured a 180 millimeter infrared lens and a focal plane shutter.

Cameras were the most complex and intricate designs produced by the firm to that date, and they represented a determined step forward in the miniaturization of its optical instruments. Added to the design challenges presented by demands for smaller and smaller optical components, the need for mechanisms such as motors, gears and shutters further forced the company to broaden its design and manufacturing focus.

With the diversification of Nippon Kogaku's product line came the addition of a new factory at Hoyama, and together with aerial cameras came a series of designs for land reconnaissance cameras featuring telephoto lenses. See the Jeff Alexander article.

It says in the 40 years history book that Nippon Kogaku began experimenting with manufacturing photo equipment around 1931. Masatomo Godai, who was an engineer, broadened his knowledge in this field from his trips to Europe and the US. Upon returning, he focussed his work on development in this field (p.546).

Godai visited five countries (Germany, Italy, France, England and the US) in February - August of 1930. The official purpose of this trip was to inspect the current status of the optical industries overseas, and he went as an commissioned worker to the Ministry of the Army. He had since been the central figure in camera production, although the cameras were for the military.

I did some research on the military cameras that were manufactured by Nippon Kogaku in pre-war Japan. The main products were the 5 meter telephoto camera, the periscope style telephoto camera, the automatic aerial camera, the small aerial camera, and the micro aerial camera. All the mechanical parts for these products were made by Godai and his crew.

Of these cameras, the small aerial type camera began being developed at Nippon Kogaku in 1933. The lens had an 18 centimeter focal length, and the shutter was of the Compur style. One set the shutter by rotating the handle that holds the camera, and each of the twelve dry plates would fall in to place as one pulled the lid of the holder. A separate film holder was manufactured. The camera had a full complement of functions. This was adopted by the Army as the 96 style small aerial camera. (Made by Rokuosha? Toko? Tokyo Kogaku? Yoshio Inokuchi.) This camera was made of a lot of parts, and it required a high degree of precision to manufacture: only Nippon Kogaku was able to produce it. Later the 18 centimeter lens was not good enough as photos had to be taken at higher altitudes. Eventually, it was replaced by the 100 style small aerial camera, produced by another company.

In 1935 three companies, Nippon Kogaku, Tokyo Kogaku and Konishi-Honten, completed to produce the micro aerial camera for which the military specified a focal length of 7.5 centimeter with a format of 6x6 centimeter, an automatic coil system and the use of Kodak Brownie Camera film. The camera was to be used by fighter air plane pilots as well. I heard that the first prototype was made by Nippon Kogaku, under Godai's guidance. From Arakawa: NHS Nikon Journal 73, page 5 to 7.

Aerial Camera SK, type 96, model 2. The model 2 was made from 1936, the lens is an rare 179.5 millimeter f/4.5. See also NHS Journal 3 & 7 for similar lenses. It could be used with roll film or plate film.
Automatic Aerial Camera No 1 type 2 Nippon Kogaku.
See:
http://www.asahi-net.or.jp/~ku3n-kym/heiki0/nasmS/nasmS.html

Automatic Aerial Camera No 1 type 2

Later, the preference with the micro aerial camera shifted to a much smaller and lighter camera that used 35 millimeter film. A test was done attaching a handle to a Leica. This resulted, in 1940, in a new prototype by Nippon Kogaku and Konishiroku called the 99 style micro aerial camera. See NHS Journal 48, an article by Richard Lane.

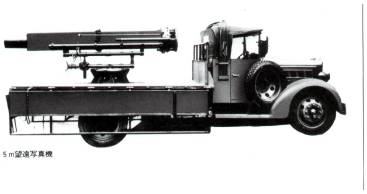
The Hotaikyo Camera 96 or also known as the Artillery Telescope Camera was developed for the Japanese Imperial Army (artillery) to take pictures on the battlefield. Nippon Kogaku thus first developed this camera in 1936 which uses 82x107 millimeter dry-plates and the focal length of the relay lens was about 20 centimeter and combined with the telescope was about 200 centimeter. The camera was produced through the end of the war. See the article from The Boowu Shop at: www.stores.ebay.com/id'1079750.

The Hotaikyo Camera 96. The camera has number 292. In this article is a picture of the Artillery telescope MK-93. These binoculars could be attached to the camera with the auxiliary connection arm to increase magnification. The Artillery camera could also be attached to the 10x4.5 artillery telescope (trench binoculars). The NHS Nikon Journal 39 has an article with great pictures: The Original Nikon "1"? by Mike H. Symons and assisted by Masahiko Fuketa.

"Nippon Kogaku manufactured a large-scale aero camera of the name of 'Army Aero Camera Mark I' in Showa 19 (1944). This camera is a reconnaissance camera manufactured by the instruction of the Japanese Imperial Army. Increasing production was necessary, and Nippon Kogaku manufactured one model mark II only by 50 centimeter F/5.6 lens. This lens was designed for using by 10,000 meter high sky. The large-scale reconnaissance camera was an electric controlled. The exposure adjustment and the film wind up were able to be done electrically. These 600 cameras were produced by Showa 20 (1945) when the war had ended." Quotation from Nikon History 75 Years, Page 78":
See the Michio Akiyama article, with pictures from 2 other cameras from Nippon Kogaku at: The Recron Aero NIKKOR 50cm F5_6 and Sentimental History.htm.
And: http://homepage2.nifty.com/akiyanroom/redbook-e/vintage/aero01.html

Army Aero Camera Mark 1 Type 2. This big reconnaissance camera had an electrically controlled exposure adjustment and film winder. This camera was mounted in Japanese Imperial Army Reconnaissance Air plane. Lens: 50 centimeter F/5.6 Film: 23 centimeter width roll film.

Nippon Kogaku made in 1940 an 5 meter f25.0 telephoto camera, for the Japanese military for photographing manoeuvres at great distances. It was permanently mounted on a flat-bed truck. Pictures of this item appeared several times on the internet and historical Nikon literature. There is a picture in NHS Journal 73, page 7.



(photo from 75 Years History)

"The following Aero-NIKKOR were made by Nippon Kogaku:
** Showa 7 (1932) Aero-NIKKOR 50cm F4.8*
** Showa 7 (1932) Aero-NIKKOR 70cm F5*
** Showa 8 (1933) Aero-NIKKOR 18cm F4.5*
** Showa 12 (1937) Aero-NIKKOR 7.5cm F3.5*
** Showa 14 (1939) Aero-NIKKOR 10cm F5.6 (Wideangle)*
I read the book in detail. And, finally, I found the following descriptions. I got excited.

"Nippon Kogaku manufactured a large-scale aero camera of the name of 'Army Aero Camera Mark 1' in Showa 19 (1944). This camera is a reconnaissance camera manufactured by the instruction of the Japanese Imperial Army. Increasing production was necessary, and Nippon Kogaku manufactured one model only by 50cm F5.6 lens. This lens was designed for using by 10,000m high sky. The large-scale recon camera was an electric controlled. The exposure adjustment and the film wind up were able to be done electrically. These 600 cameras were produced by Showa 20 (1945) when the war had ended." Quotation from Nikon History 75 Years by Michio Akiyama, Page 78."
See: http://homepage2.nifty.com/akiyanroom/redbook-e/vintage/aero01.html

The Nikon Corporation says ont their website that the production of Aero NIKKOR lenses for aerial cameras is launched in 1933. (Nikonimaging.com - technology - NIKKOR)

In 1945 a story was told that in the Ohi factory there was a shelf full of completed AF Telephoto's (two meter telephoto cameras) because the army wouldn't pick them up. NHS Journal 72, 2001, pages 12-15: The name is Nikon

Nippon Kogaku manufactured the SK 100 camera bodies and lenses. An example was depicted in "NHS 57 article from Richard Lane". The WW2 vintage Aero-NIKKOR matches the Aero-NIKKOR lens No_38317436 f/3.5, 20 centimeter". Rear barrel diameter is about 2.8" and there is a screw-on 3 ear bayonet mount. See: homepage2.nifty.com/akiya...ero01.html.

The 20 centimeter lens was made for the SK-100 aerial camera. Nippon Kogaku was one of many manufactures of this camera and lens. The SK-100 was also designed for use with a 40 centimeter lens. The bayonet mount on these lenses allowed them to be removed and interchanged.

The Camera is a model 100, #2353, with Aero NIKKOR 20cm, f 3.5 lens. No. 38317453. The second lens, same markings is 38317438. I was told they are from 1941 from photos I took to NKK about 20 years ago, but I see from your list lens no. 38317436 is listed as 1944, so maybe my items are from 1944 also. I believe the NKK people may have just taken a guess. I don't think they looked it up in the archives. The label on the wooden case the camera came in has the same markings and number as on the camera, but the place for month and year are blank. The #2353 is identical to the one shown in the article (#2360 with lens #38317420). I guess that would make it an SK 100, circa 1944?. According Bill Kraus.

A 500 millimeter Aero-NIKKOR. The serial number of this lens (38352328) raises some questions, mainly due to its length. We are all aware of Nippon Kogaku's practice of using three or four digit number blocks at the beginning of the serial number to indicate dates of either development or production.... eg. '609" indicating September 1946; '801"for January 1948; '5005" for May 1950, etc. The serial number on this lens doesn't seem to follow this logical pattern. If one were to break down this number into definable blocks, can it be argued that the first three digits comprise the date. '383" for March 1938? This being the case, would it also indicate that this was the 52,328th such lens produced? That seems highly improbable. Perhaps on items produced for the miltary a completely different numbering system was used, one that we collectors, are not familiar with. Another possibility is the serial number can be broken into three different segments, such as...

383-date identification (March 1938)
52- product identification code (50cm/f5.6)
328-number of units made.

Naturally, all this is mere speculation, but I'm sure if records were ever found, some logical numbering scheme would be evident. See the complete text in Mike Symons article in NHS Journal 29.

In 1936 Nippon Kogaku produced its very first rangefinder to be used on camera's. The Microtester, produced in 1937, was able to measure horizontal lengths.

9. Microscopes

When I looked on the internet for Nikons first microscope, I found this:

The drawing illustrated above was made from a photograph of the original microscope in Nikon's archives. The revolving nosepiece holds three objectives that are interchangeable with standard screw threads. The flat, square stage is fixed to the limb with a plate attachment. A substage Abbe condenser collects light from a double mirror mounted on a tailpiece. The limb is connected to the base with a pivot mechanism and contains the rackwork for the fine and coarse focus adjustments.

http://www.microscopyu.com/museum/firstnikon.html

And I'm sorry for the owner of this home page, but this information must be wrong. I send some mails but the reaction was, this is the first.

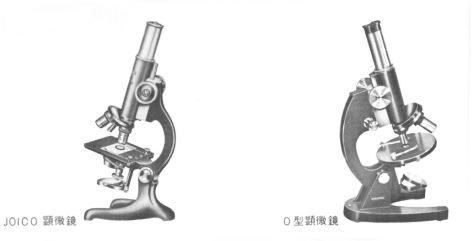
In the book Nikon's 75 Years history I found two drawings of the first microscopes.

The microscope Victor II was the first microscope Nippon Kogaku made in 1923. This type is listed in Nikon 75 Years History, but I can't find a Victor I, except a Victor binocular, made by Fujii Lens in 1911. So I think the Victor II microscope must be a prototype.

In the same year Nippon Kogaku also produced a microscope with scale graduation and co-ordinate comparator.

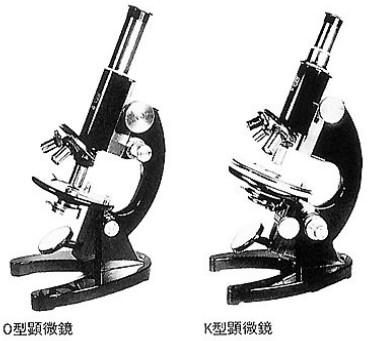
Left: prototype Victor 2 from 1923, right first production model: Joico from 1925 (from 75 Years History)

Production of a microscope model, named Joico started in 1925. With a revolving nosepiece and interchangeable objectives. This compound monocular microscope is fashioned from brass and has a black-enamelled horseshoe base. The revolving nosepiece holds three objectives that are interchangeable with standard RMS screw threads. From John Millham: *"The "standard" screw thread is the RMS thread, which stands for Royal Microscopical Society. It is usually referred to as the RMS thread. Some early microscopes, like Ross and Beck, had a slightly different thread".*
The flat, square stage is fixed to the limb with a plate attachment. A substage Abbe condenser collects light from a double mirror mounted on a tailpiece. The limb is connected to the base with a pivot mechanism and contains the rackwork for the fine and coarse focus adjustments. Maximum magnification is 765x. On several internet sites one can see a drawing of the Joico microscope. This illustration was made from a photograph of the original microscope in Nikon's archives. There are yet no pictures known of an Victor II or Joico microscope.



Joico microscope 1925 + type O (from 75 Years History)

In 1935 Nippon Kogaku made a microscope model Nikko. This microscope made magnifications from 20x to 1350x. In the years 1920 to 1947 the "Nikko" sign was frequently used. See the Arakawa article in NHS Journal 80, page 6 +7.



O + K type microscopes (from 75 Years History)

See: http://www.nikon.co.jp/main/eng/portfolio/about/history/corporate_history.htm

10. Bomb-sight

In 1937 Nippon Kogaku bought a small aeroplane to test bomb-sights. The aeroplane was called Nikko, had place for three people and had 450 horsepowers. The Haneda airfield became its home base.

The 'type 90 Bomb-sight model 2" was made in June 1937. It was used on the Nakajima B5N2 Type 97 Bomber air plane (Allied name Kate). Probably a 100 bombers used this bomb-sight. (Extracted from Richard Lane's text, See his article in NHS Journal 69, page 9, 10 + 11.).
The 'Type 95" Nikko bomb-sight is an non-magnifying sight with a field of 20 degrees. The sight measures 27 inches long with a diameter of 1: inches, It weights just under 6 pounds. The optical system of 6 elements in 3 groups, provided a eye-relief of 74 millimeter. Therefore it was possible to mount the bomb-sight on the nose of an Aichi D3A1 type 99 (Allied name Val) air plane, just in front of the windshield. The reticule was a rectangular grid pattern with scale markings. The 'Type 95" was also used on the Mitsubishi F1M2 type Zero observation Seaplane (Allied name: Pete). This type bomb-sight was made in 1941 and used for the Pearl Harbour attack. There is an earlier type know, build before 1941, without an protective front cover. Extract from Richard Lane's articles in NHS Journal: N K Optical Ordnance. There are several publications in NHS Journal 40 14, 41 12, 42 14, 43 14, 44 11, 45 14, 47 14 and 48 1.

11. Stereoscope

In 1925 Nippon Kogaku started with the technique to mark stereo photo's.

The Nippon Kogaku stereoscope (stereo viewer) is now known in two versions:

Type 97. This stereoscope was designed for viewing maps in stereo mode. By viewing in side-by-side stereo mode, it is possible to determine elevation differential and thus terrain. See the Les Seeligson article in NHS Nikon Journal 54

Type 98: The type 98 stereoscope can be used to look to stereo graphic prints from 3x5 to 8x10 inches. The stereoscope is made of brass with black enamel paint. There is an thumbscrew on the button used to lock in the adjustable interocular distance between 58 and 68 millimeter. There are eyelet slots for a neck strap. The oculars have an detachable rubber eyecup, to minimize stray light. There are two prisms, but there are no optical elements for increase magnification. See the Richard Lane article in NHS Journal 77, page 11 + 12.

12. Trench binocular

13. Who made these optical items

In the Yokohama Japanese WWII Radio Museum you can see several camera's and other optical items:

Army GSK-99 Aero Camera; Navy Type F8 Aero Camera; Army Model "Hayth" Aero Gun Training Camera; Army Model "Rubaroa" Aero Gun Training Camera; Army Model 1 Aero Gun Training Camera; Navy Model 89 Aero Gun Training Camera; Periscope Type 1 Improvement 5; Navy 6.5 centimeter Telescope Type 2I-401 Submarine Deck Gun-sight; Navy Model 1 Gun-Bomb-sight ControllerType 2, 3 Gun-sight; Navy Model 96 Range Finder (66 centimeter); Navy Model 96 Sextant. See: http://www.yokohamaradiomuseum.com/etc2.html.

7. Post-war production

The allied occupation forces demanded that Japan's large industrial groups disband. Mitsubishi Headquarters disbanded on September 30, 1946, and many of the Mitsubishi companies split into smaller enterprises. The trading arm fragmented into 139 companies. Most of the Mitsubishi companies abandoned the name and emblem under pressure from the occupation forces. On the outbreak of the Korean War, the occupation policy shifted to an emphasis on industrial and economic reconstruction. Some of the Mitsubishi companies reconstituted themselves, and most began using the name and emblem again. But they retained their autonomy. The companies achieved far more individually and independently than they ever could have accomplished as a single organization. At the same time, they benefit from the shared sense of community that accrues from a common history and corporate culture.

At the end of WW II Nippon Kogaku had 19 factories and 23,000 employees. But other authors say up to 26 factories and 25,000 employees.

The American Forces closed down all Nippon Kogaku factories. Except the Ohi facility and the Ohi Glass factory. These were also the first plants Nippon Kogaku build in the years 1917 - 1919. Nearly all the personnel was send home, including 5.000 soldiers, delinquent workers, several mobilized student workers and several civilian volunteers. With 1,400 or 2000 people the production started at the Ohi site.

For obvious reason, the American occupation authorities forbidden its further development and supply of weapon-related products of such nature and the company, like many others are desperately to look for a substituting market, which is abroad for its continual survivor. See: http://www.mir.com.my/rb/photography/hardwares/history.

Following Japan's surrender on August 15, 1945, Nippon Kogaku's operations were halted and its plants remained idle while the occupation authorities SCAP (SCAP ' Supreme Commander for the Allied Powers) considered how the company should be reorganized. Undeterred by the layoffs that would cut its workforce to a mere 1,725 employees. Christian Ozdobas mentions 1,400 and Peter Abrahams mentions only 900 people in 2 factories.) firm's directors set about coordinating a series of 15 working groups to examine its potential manufacturing options. These groups were essentially tasked with the creation of a product line that would enable the company to employ its considerable technical skill to the continued production of existing designs.

The company had been founded solely to produce optical weaponry and had produced military products exclusively up to he day of the defeat, but then the company made an about face and began producing commercial items for civilians, a task for which it had absolutely no previous experience.

On August 16 and 17, 1945, so the first day after the surrender, there was a meeting chaired by mister Koshiro Shiba, who was chairman of the board between 1924 and 1944. All the officers and directors were called to attend the meeting.

Shiba proposed the following: Our company developed solely by military production. Given the current situation, it would be impossible to continue the business at the present scale. So we have to lay-off

and downsize the production, and the numbers of personnel. See also Forty Years, page 241 and Arakawa: NHS Journal 72, 2001, page 12-15: The name is Nikon.

I'll think that the business re-started on August 18, 1945 with producing and selling of binoculars, microscopes and measuring instruments. Nippon Kogaku could used old stock and replacement articles to start with. Nippon Kogaku wartime binoculars were outstanding. Every US soldier liked to bring one back home. From all warships, submarines, sunk ore not, the binoculars came of first. There were more soldiers than binoculars. The first three questions after the war were: who made these bino´s? Are there more bino´s in stock? Can you make more of these bino´s? In 1945 Nippon Kogaku sold the 3.5x25.5 Spica binocular; the 6x24 and 8x26 Orion binocular, the 7x50 type, and I'm sure that they sold numbers of the (military) 10x70 binocular. If you look nowadays on the internet for buying an Nikko 10x70 binocular, there is only one country were these binoculars are sold: the USA.

It is told that General MacArthur asked to produce camera's "so that the G I's could buy cameras and not spend their money on sake and whores.

Four key innovations made by Nippon Kogaku during its years as an optical munitions supplier would later prove to be of paramount importance to the company's postwar manufacturing success.

First, the experience gained in the production of prisms for periscopes and rangefinders was to be of crucial significance. Nikon would later find itself in a position of leadership during the revolution of the photography world by the reflex cameraCof which prisms were the vital component.

Second, the innovative lens coatings designed for submarine periscopes were later found to improve the performance of photographic lenses. Coatings that utilized as few as four elements were able to increase the transparency of the glass and reduce light loss, thereby improving the overall performance of the optics.

Third, the company's own wartime systems of mass-production for such items as binoculars provided the experience needed to begin producing instruments in higher volumes.

Finally, the early experimentation that had been conducted by the company into the rudimentary integration of optics, electronics, and mechanical devices would enable it to continue on as a pioneer in that field.

While most of these key considerations were not yet evident to the company's 15 working groups in the fall of 1945, their aim was to pinpoint Nippon Kogaku's strengths as an optical manufacturer and assess their potential value to the civilian market. They were tasked, however, with the evaluation of over 70 possible designs, including cameras, telescopes, surveying equipment, projectors, clocks, spindles, lights, calculators, and even surgical equipment. See: Nippon Kogaku Kogyo Kabushiki Kaisha: gojunen no ayumi, p. 77. (50 Years history)

The groups began making their assessments on 1 September 1945, and by 20 September they had selected 38 of the designs as the most eligible candidates. The most successful items chosen for production were the binoculars previously designed for the use of Japan's military forces during the warC models that featured names such as Galileo, Novar, and Orion. Many of these wartime-issue binoculars had already become highly sought-after trophies of US Naval officers, and American servicemen continued to be the company's most eager customers after production resumed in April 1946. See: Richard J. Samuels, Rich Nation, Strong Army: National Security and the Technological Transformation of Japan (Ithaca, NY: Cornell University Press, 1994), p. 308; and S.E. Morrison, History of United States Naval Operations in World War Two, Vol. 3 (Boston, MA: Little, Brown, 1947B1964), in Howe, p. 306.

By that date, a mere eight months since the end of the war, the company began manufacturing a line of products that included: camera lenses, five types of binoculars, a pocket telescope, a microscope, a water level, land-use and astronomical telescopes, and several types of spectrographs. See: Nippon kogaku kogyo kabushiki kaisha: gojunen no ayumi, p. 77. (50 Years history)

In September 1945, Nippon Kogaku's Consumer Goods Production Subcommittee also proposed the production of a camera, and by November of that year the Camera and Projector Committee had started its investigation of the designs. See Itoh, Mikio, 'Archivist's Memo No. 1', in Nikon Company, available online at: http://www.nikon.co.jp/main/eng/d archives/camera/history_e.htm

Engineers began working with designs for an 80 millimeter twin-lens reflex camera, as well as a small coupled rangefinder camera with a focal plane shutter and an interchangeable lens that would use 35 millimeter film. The 80 millimeter TLR design was eventually abandoned, however, and the smaller model was selected and given the name Nikorette. See: Nippon Kogaku Kogyo Kabushiki Kaisha: gojunen no ayumi, p. 79. (50 Years history)

Shortly thereafter, the abbreviated version of the company name, Nikko, was changed to Nikon, and when this name was applied to the firm's prototype 35 millimeter camera it became known as the Nikon model I. Twenty prototypes were ordered in 1946, and in March of that year the company's new name was officially announced. Finally, in February 1948, the camera was released.

The Capella binoculars were produced immediate after the end of the war. These were the first civilian products. Mostly these binoculars have no MIOJ gravure, because that came later. These Capella binoculars were cheap, but at the end of 1945, and beginning of 1946, more Japanese optical industries start the production of binoculars. These binoculars were cheaper, and were not so good as the Capella. But the Capella binocular did not sold much, because of the price. That's why the Capella very collectable now.

First production after the war:

In 1945	Production of Capella binoculars.
In 1946	Production of the f/4.5 75 millimeter lens for the Mamiya Six.
In 1946	Production of Look binoculars.
In 1946	Production of Eyeglass Lens Pointal.
In 1946	Starting developing x-ray camera 6x6, production ready in 1947.
In 1947	Surveying Instrument: the Tilting Level Type E. Maybe production started already in 1946. Later in 1947 also Transit Type G.
In 1947	First lens: 135 millimeter f/4.0.
1948	First rangefinder camera model I and lenses 85 millimeter f/2.0; 35 millimeter f/3.5.
In 1948	Microscope model O.
In 1949	Profile projector type I;
In 1949	Lens 50 millimeter f/1.5.

1. Fluoro-Record Camera

Due to malnutrition and the bad hygienic environment, Tuberculosis of the lungs prevailed. In order to cope with this situation , the government, under the guidance of General Head Quarters (GHQ) (the US occupation forces) organized a commission and took measures to promote group x-ray examinations of the public. For mass examinations in those days they used x-ray fluoroscopy by 35 millimeter cameras with a format size of 24 x 32 millimeter. However, among the Commission members there was a strong opinion that the image size should be much bigger in order to mis-diagnosis. At the urgent request of the Commission we (Nippon Kogaku) started to design a fluoroscopy camera of 6 x 6 centimeter format, and in October 1947 we put it into production. The prototypes were tested by the Commission and the results were satisfactory. They made a concrete plan to switch the format from 24 x 32 to 6 x 6 centimeter. Unfortunately, the plan was rejected by the government due to the very poor financial situation of the country, and we stopped production.
There were only 30 to 50 units made. Some of these bodies were later converted into the 6 x 6 Nikon Sky camera.
According Masahiko Fuketa in: The Nikon 6x6 x-ray camera, Nikon Journal 40, an article by Mike Symons.

In 1992 a Nikon 6 x 6 camera with number 22790 is reported to have been seen in the New Jersey area (USA). Complete with a Regno-NIKKOR-C lens, 10 centimeter f/1.5 with number 71028 (October 1947) ... the 28th production lens. In 1993 Fuji Collectable Cameras from Boulder Co, USA purchased a

camera body with number 80282 an a lens with number 71085. This can mean that Fuketa's numbers maybe wrong, because this has an higher number than 30 ore 50.

2. Vertexometer

An Vertexometer is an Nippon Kogaku word for a Dioptometer. It measures the diopto magnification (of a lens). There is an type I and one type II. See 75 Years of Nikon. Type I is 270 times produced between 1947 and 1953". It gives an Vertex power of +/- 25 diopters. The diopter scale appears in the same view field of target. Measurements can be done in 0.25 diopter. See the Peter Lownds article in NHS Journal 46.

Vertexometer 1947
(from 75 Years History)

3. MIOJ

On February 20, 1947, the US General MacArthur signed the document SCAPIN 1535, which required all export items carry to carry the MIOJ mark for 'Made in Occupied Japan'. SCAP Post-war control of Japanese exports was held by US military offices until August, 1949.The MIOJ requirement was in force until SCAPIN 2061, December 5, 1949, (another source places this date at the treaty signed on September 8, 1951, becoming effective April 28, 1952). After one of these dates, 'Made in Japan' or 'Japan' were used. In 1952, the military occupation of Japan ended.

4. Post-war comeback 1945 - 1954

Despite the marked social despondency and scarily of commodities in Japan just after the war, production of cameras was resumed surprisingly quickly. The reason for this was that the General Headquarters of the Occupation Forces ordered that cameras be supplied by Japan for sale to military personnel, for private use. This earned hard currency which could be used to help purchase imported food, essential to rescue Japan from starvation.

In 1950, more than 100,000 pieces of 35 millimeter, folding, twin-lens and other cameras were produced. These were all marked Made in Occupied Japan. Theoretically, these could officially be sold domestically, but with an 120% tax levied on them, they were simply beyond the means of most Japanese at the time. Consequently, many different types of cheap mini-cameras (these took 14 millimeter width roll film with backing paper) were made and sold.

Although the cameras produced in this period were basically the same as previous pre-war models, wartime optical precision instrument technology, had a very strong influence on the camera industry and cameras that were much more advanced than those produced before the war began appearing. Among these were the Nikon type M, the Canon IV Sb and other models.

In 1950, during the Korean War, photos taken of the war with a NIKKOR lens by a Life magazine cameraman, Mr. David D. Duncan, were very well received. The boost this unexpected praise gave the Japanese camera industry is almost unbelievable.

While the Life photographers were not blown away by the NIKKOR wide-angles, they really loved the 50, 85 and 135 millimeter lenses and shot the Korean War with them. The optical performance was such that those pictures made Nikon's reputation. This line is from: hppt://www.dantestella.com/technical/nikoleic.html.

Economic expansion resulting from the Korean War stimulated domestic demand for cameras and brought an unprecedented boom. Countless small and large companies were pitted against each other and there were about 80 types of twin-lens reflex cameras being produced.

With the end of the Korean War in 1954 came a sudden depression. As a result of this, small manufacturers with weak management structures became insolvent one after another, and thus only companies that could withstand the excessive competition advanced as leading manufacturers.

But even these leading manufacturers had to take stringent measures to rationalize, and it could be said that they were forced to explore sales routes overseas. They realized the importance of co-operation and established JCIA (Japan Camera Industry Association) and JCII (Japan Camera Inspection Institute) in 1954". From the same article in The evolution of the Japanese Camera.

There were also an Japan Telescopes Inspection Institute (JTII) and an Japan Optical and Precision Instruments Manufactory Association.

5. Industrial Standardization Law

The first Industrial Standardization Law was announced in 1949 leading to the establishment of the Japanese Industrial Standards Committee (JISC). In 1952 the JISC became a member of the International Organisation for Standardization (ISO) followed in 1953 by its membership of the International Electrotechnical Commission (IEC). Therefore Japanese standards are known now world wide.

6. Other Japanese 35 millimeter cameras before the Nikon I

The Nikon I was probably the first 135 format rangefinder camera made by Nippon Kogaku in 1948. Ideas for this camera came mostly from an Contax II and an Leica III, 135 format rangefinder camera. Since 1940 Nippon Kogaku made already 135 millimeter format cameras for the Army. But there were in Japan already more home made 135 format (or smaller) cameras:

year	camera	type	format	manufacturer
1912	Radio	Special	31 mm	Ueda Camera Store
1926 10	Record	Box	35 mm	Konishi-Honten
1935 4	Super Olympic	Miniature	135	Asahi Bussan
1935 9	Hansa Canon	Miniature	135	Seiki Kogaku Kenkyusho
1938 8	Boltax	Viewfinder	24x24	Minagawa Seisakusho
1939 2	Canon Jr.	Viewfinder	135	Seiki Kogaku Kogyo
1940	99 style micro aerial camera		135	Nippon Kogaku
1947 5	Minolta 35	Rangefinder	29x32	Chiyoda Kogaku Seiko
1947 11	Bolty	Spring	24x24	Chiyoda Shokai
1948 5	Minion 35	Viewfinder	24x32	Tokyo Kogaku
1948 8	Olympus 35 I	Viewfinder	24x32	Takachiyo Kogaku Kogyo
1948 9	Hansa Jupiter	Box	135	Omiya Photo Supply
1948 10	Nikon camera type I	Rangefinder	24x32	Nippon Kogaku Kogyo
1948 10	Mamiya 35	Rangefinder	135	Mamiya
1949 2	Canon II B	Rangefinder	135	Canon
1949 3	Minolta 35	Rangefinder	135	Chiyoda Kogaku Seiko
1949 7	Nikon type M	Rangefinder	135	Nippon Kogaku Kogyo

This list makes clear that Nippon Kogaku was not the first Japanese producer of a 135 format Rangefinder camera. See for an complete list: page 188 a.f. The History of Japanese Camera.

7. Early Japanese film format on 135 film

There was an preference in the Japanese market for the 24x32 millimeter film frame format instead of the standard 24x36 millimeter format used by most manufacturers. This smaller format saved film, permitting an increased number of exposures on a roll film. There was a number of Japanese professionals who advocated this format because it permitted enlargements to 8x10 Inch, without cropping. However, the reduced size was not continued because it was not compatible with automatic processing and printing machines used worldwide. The Allied Occupying Forces required that the format be changed. It was allowed to make the 24x34 format, for use in Japan only. The new format could be achieved easily without retooling of the basic camera housing. It was the Nikon rangefinde camera type S with the smaller format, bought in Japan, which found its way to the Korean War.

Other photographical manufacturers in Japan made also camera=s with a 24x36 film format, or smaller:

manufacturer	camera	production from : till	format size mm
Asahi Bussan Corporation	Super Olympic	1935	24x36
Seiki Kogaku Kenkusho	Hansa Canon	1935	24x36
Minagawa Seisakusho	Boltax	1938	24x24
Chiyoda Kogaku Seiko	Minolta 35	1947	24x32
Tokyo Optical Corp, Ltd.	Minion 35	1948	24x32
Takachiyo Kogaku Kogyo	Olympus 35	1948	24x32
Nippon Kogaku	Nikon camera type I	1948 1949	24x32
Nippon Kogaku	Nikon type M	1949 1951	24x34
Chiyoda Kogaku Seiko	Minolta 35 II	1949	24x32.5
Chiyoda Kogaku Seiko	Minolta 35 III	1949	24x34
Chiyoda Kogaku Seiko	Minolta Memo	1949	24x36
Nippon Kogaku	Nikon type S	1950 1954	24x34
Nippon Kogaku	Nikon type S2	1954 1957	24x36

The change to 24x36 in 1954 by Nippon Kogaku is a very late change. At that time Nippon Kogaku should know that most of their production went abroad. And that the price in Japan was much higher because of taxes.

8. Lenswear

Nippon Kogaku started making eyeglass lenses since 1946.
http://www.nikon-lenswear.com/about/our-history

8. Nippon Kogaku production list

For me, the production list started with an translation of a part of pages 111 till 122 of the 75 Years Nikon History book appendix. After that I updated this list with all other items I found, except non optical weaponry. The translation was very difficult. In the original text there is sometimes nearly no difference between an binocular (with or without scale), an periscope, an tank eye glass, an trench periscope, an sight, an telescope, a rangefinder, etc.

Next is a list of items (exept the binoculars) made by Iwaki Glass Seisaku, Tokyo Keiki Seisaku-sho, Fujii Lens Seizo-sho and Nippon Kogaku Kogyo Kabushiki Kaisha, nowadays called the Nikon Corporation. So I'd like to start in 1881 and stop in 1949. So there is an small overlap with the rangefinder camera era. It is by no means complete, but a basis for expansion. Please help me if you can make additions.

update:
May, 2005

The following is a list of items (exept the binoculars) made by Iwaki Glass Seisaku, Tokyo Keiki Seisaku-sho, Fujii Lens Seizo-sho, Nippon Kogaku Kogyo Kabushiki Kaisha nowadays called the Nikon Corporation. So I start in 1881 and stop in 1949. So there is an small overlap with the rangefinder camera era. It is by no means complete, but a basis for expansion. Please help me if you can make additions.

Product till 1949	year	name	centimetre	f1:/	format	style
auto collimator	1942	Auto collimator to measure flatness				civil
bomb-sight	1937	Nikko bomb-sight model 2				type 90
bomb-sight	1940	Nikko bomb-sight				type 95
bomb-sight	1941	number 1, to aim bombs				Navy
bomb-sight	1941	model 2 number 1, prototype				Navy
bomb-sight	1942	model 3 aiming device with coating				Navy
bomb-sight	1943	model 2 number 1				Navy
bomb-sight	1944	model 10				Army
camera	1929	Konishi Lily Hand Camera (N.K. sold Anytar lenses and helped with lens mounting?)	12	4.5		
camera	1933	Small Camera an NIKKOR lens, also used by the Army	18	4.0		Air force
camera	1933	96 model small aerial camera, with NIKKOR lens	18	4.5	dry plates	Air force
camera	1935	camera with binocular	300			Navy
camera	1935	Konishi Idea Hand Camera with NIKKOR lens	10.5	45	6.5x9 cm	
camera	1935	Hansa Canon (N.K. made the lensmount, viewfinder, range-finder, optical system	5	35	35 mm	
camera	1935	micro aerial camera	7.5		6x6	
camera	1936	Hotaikyo Camera 96 with 10.5 cm lens and built-in developing equipment	10.5		82x107dry-pl	
camera	1936	Artillery Telescope Camera #257; #292;	20		dry-plates	96 style
camera	1936	small aerial camera type II	18		dry plates	96 style
camera	1939	röngten camera and lens	5	1.0		civil
camera	1939	camera with binocular	500			Army
camera	1940	5 metre telephoto camera	50	25		
camera	1940	micro aerial camera			35 mm	99 style
camera	1944	automatic aerial camera	50	5.6	18x23 cm	Navy
camera	1944	SK-100 camera body and lens (#2352)			Aerial cam	Army
camera	1945	2 metre telephoto camera				J 72: p 14
camera	1947	multipurpose camera 2 pieces prototype of the later Model I rangefinder camera				civil
camera	1948	model I			24x32	civil
camera	1948	multipurpose X ray camera			6x6 cm	civil
camera	1949	model M			24x34	civil
camera	1947	Fluoro-Record X-ray camera	10	1.5	6x6	
dioptometer	1947	Dioptometer nr I (Vertexometer)				civil
enlarging lens	1937	Hermes Enlarging Lens for Hansa Enlargers	5.5	3.5		
enlarging lens	1948	EL NIKKOR	5	3.5	35 mm	
fire-control unit	1934	93 model "shahoban nr 1"				Army
fire-control unit	1938	97 model high angle calculation device				Navy
fire-control unit	1938	model 98 with graduation scale				Navy
fire-control unit	1939	for longitude and latitude measuring				Navy
fire-control unit	1939	model 97 with longitude and latitude measuring				Navy
fire-control unit	1941	shagekiban for Yamato warship	1500			Navy
glasses	1946	Pointar				civil
gun-sight	1925	model 88 anti aircraft aiming apparatus				Army
gun-sight	1937	97 model sharp shooting visor		10°	2.5x10	Army
lens	1925	Flieger Objective	50	4.8		
lens	1926	Flieger Objective	50	5.4		

lens	1929	Porträt Objective	24	3.0		
lens	1929	Porträt Objective	30	3.5		
lens	1929	Projections Objective	7.5	2.0		
lens	1929	Projections Objective	12	2.0		
lens	1929	Anytar	12	4.0	6.5x9 cm	
lens	1929	Trimar	50	4.8		
lens	1931	Anytar	12	4.5	6.5x9 cm	
lens	1932	Dialyt Anastigmat	7.5	6.3		
lens	1932	Doppel Anastigmat	7.5	6.8		
lens	1932	Dialyt Anastigmat	10.5	6.3		
lens	1932	Doppel Anastigmat	10.5	6.8		
lens	1932	Dialyt Anastigmat	12	6.3		
lens	1932	Doppel Anastigmat	12	6.8		
lens	1932	NIKKOR	7.5	4.5		civil
lens	1932	NIKKOR Anytar	10.5	4.5		civil
lens	1932	NIKKOR Dialyt Anastigmat	12	4.5		civil
lens	1932	NIKKOR Aero-NIKKOR	18	4.5		civil
lens	1933	Anytar	15	4.5		
lens	1933	Doppel Anastigmat	15	6.8		
lens	1933	Doppel Anastigmat	18	6.8		
lens	1933	Aero NIKKOR	70	5.0		Air force
lens	1933	Aero NIKKOR	50	4.8		Air force
lens	1933	Anytar	18	4.5		
lens	1935	for Hansa Canon	5	3.5	35 mm	C. bajonet
lens	1935	for Hansa Canon	5	4.5	35 mm	C. bajonet
lens	1937	NIKKOR lens for the Hansa Canon	5	2.0	35 mm	C. bajonet
lens	1937	lens X-ray equipment	6	0.85	6x9	16mm cine
lens	1938	meteorological lens	1.63	8.0		civil
lens	1939	for Canon J	5	4.5	35 mm	J thread
lens	1939	for Canon S	5	4.5	35 mm	C. bajonet
lens	1939	for Canon J	5	3.5	35 mm	C. bajonet
lens	1939	for Canon S	5	2.8	35 mm	C. bajonet
lens	1939	for Canon S, external aperture ring	5	2.0	35 mm	C. bajonet
lens	1939		5	4,5	35 mm	screw
lens	1939	Aero-NIKKOR wide angle	10	5.6		
lens	1939	NIKKOR lens for Canon	5	1.5	35 mm	
lens	1939	NIKKOR lens for Canon	5	2.0	35 mm	
lens	1939	NIKKOR lens for Canon	5	2.8	35 mm	
lens	1940	98 centimetre f/4.5 for TV purpose	98	4.5		civil
lens	1940	20 centimetre f/1.9 for TV purpose	20	1.9		civil
lens	1941	Nippon Kogaku No. 150247	15.03	4.5	Aerial cam	
lens	1941	Nippon Kogaku Nr. 559	17.920	4.5	Aerial cam	#96
lens	1944	R-Aero-NIKKOR (known: No. 38352376)	50	5.6	18x24 cm	
lens	1944	R-Aero-NIKKOR (known: No. 38317436 / 38317453 / 39317438)	20	3.5	SK-100	
lens	1944	Schmidt lens for Nocto-vision	17	0.85		
lens	1945	NIKKOR with Leica mount	5	3.5	35 mm	civil
lens	1946	NIKKOR with coating	5	3.5	35 mm	civil
lens	1946	Apo NIKKOR	38	9.0		civil
lens	1946	NIKKOR H collapsible, serial numbers 609xxx	5	2.0	35 mm	Nikon I
lens	1946	NIKKOR lens for Mamiya Six III. Pre-war lens, once applied for Canon.	7.5	4.5	6x6	
lens	1946	NIKKOR with Leica mount	5	2.0		
lens	1946	NIKKOR with Leica mount	5	3.5	35 mm	Leica
lens	1946		13.5	4.0	35 mm	screw

lens	1947	Regno NIKKOR C (for x-ray camera)	10	1.5	6x6 cm	civil
lens	1948	NIKKOR lens with BaF10 glass	5	2.0		civil
lens	1948	W NIKKOR C	5	3.5	35 mm	Nikon M
lens	1948	NIKKOR O	13.5	4	35 mm	Nikon M
lens	1949		3.5	3.5	35 mm	screw
lens	1949	for Nicca III	3.5	3.5	35 mm	
lens	1948	NIKKOR QC	13.5	4.0	35 mm	Nikon M
lens	1949	NIKKOR PC	8,5	2.0	35 mm	Nikon M
lens	1949	NIKKOR H non-collapsible	5	2.0		civil
lens	1949	Cine NIKKOR	1.3	1.9		civil
lenswear	1946	Pointal				
microscope	1923	Victor type II				civil
microscope	1923	scale graduation, co-ordinate comparator				civil
microscope	1925	Joico			20x to 765x	civil
microscope	1935	Nikko			50x to 1350x	civil
microscope	1938	measuring microscope				civil
microscope	1948	microscope O for education			20x to 600x	civil
microscope	1949	model K microscope			20x to 1350x	civil
periscope	1919	model I	700		1.5x, 4,5x	Navy
periscope	1921	model II	700		1,5x, 6x	Navy
periscope	1923	model III (experimental)	700			Navy
periscope	1926	periscope	900			
periscope	1927	with longitude and latitude focus	100			Engineers
periscope	1930	88 model, number 3, night vision	900			
periscope	1936	periscope nr 1 and nr 3 for Siam	800			Army
periscope	1941	model 3	600			Navy
periscope	1941	model 4	700			Navy
periscope	1941	model 5	800			Navy
periscope	1944	97 model	350			Navy
periscope	1945	2.70 metre periscope	270			type 97
periscope	1945	1 metre periscope	100			torpedo
periscope		standard 10-metre periscope	1000			
periscope		several types trench periscopes				
profile projector	1949	Profile projector				type I
projector	1939	projection of röngten photos				civil
range finder		Model 96 Range Finder (66cm)				Navy
rangefinder	1913	Tokyo Keiki rangefinder				Navy
rangefinder	1915	Tokyo Keiki rangefinder	150			Navy
rangefinder	1916	Tokyo Keiki rangefinder	150			Navy
rangefinder	1917	Tokyo Keiki single eyed rangefinder	150			Navy
rangefinder	1917	Tokyo Keiki rangefinder and telescope	250			Navy
rangefinder	1917	1.5 metre Rangefinder				
rangefinder	1919	model Year 8 for field cannon	100			Navy
rangefinder	1920	model year 5	250			Navy
rangefinder	1920	model year 5	450			Navy
rangefinder	1923	binocular type		50°	10x50	Navy
rangefinder	1925	model 15, three dimensional type	150			
rangefinder	1925	model 14, single eyed	150			
rangefinder	1926	model 13	800			
rangefinder	1927	with penta prism				
rangefinder	1927	88 model, build to end WWII, huge numbers	300			Army
rangefinder	1928	88 model, waterproof	300			submarine

rangefinder	1928	90 model, stereo, anti aircraft	300			Army
rangefinder	1929	90 model, high angle, anti aircraft	300			Army
rangefinder	1930	90 model, to aim bombs, build to end WWII	300			
rangefinder	1931	90 model, production at Iroha Metallworks	300			Navy
rangefinder	1931	90 model,	300			Navy
rangefinder	1932	rangefinder	40		6x40	Navy
rangefinder	1933	91 model high angle rangefinder				Navy
rangefinder	1933	93 model for cannon	75			Army
rangefinder	1936	rangefinder for Siam (Thailand nowadays)	600			Army
rangefinder	1937	model 94 anti aircraft aiming device, with anti-shock				Army
rangefinder	1937	95 model high angle				Navy
rangefinder	1937	15 metre rangefinders	1500			
rangefinder	1938	98 model anti aircraft				Army
rangefinder	1941	model 93, 15 metre rangefinder and fire-controle unit	1500		Yamato	Navy
rangefinder	1941	model 98 with graduation scale			Yamato	Navy
rangefinder		10 metre Rangefinder				
rangefinder		4.5 metre Rangefinder				type 94
searchlight	1885	Iwaki Glass searchlight				Navy
searchlight	1914	Iwaki Glass searchlight hobutsenankio	60			Navy
searchlight	1915	Iwaki Glass searchlight hobutsenankio	75			Navy
searchlight	1917	searchlight	75		15x	Navy
searchlight	1917	searchlight	75		25x	Navy
searchlight	1917	searchlight	75		35x	Navy
searchlight	1921	searchlight (German model)				Army
searchlight	1938	99 model with anti condens coating				Navy
sextant	1934	92 model sextant for submarine				Navy
stereoscope		stereoscope				type 97
stereoscope		stereoscope				type 98
surveying instr	1947	Tilting Level Type E				civil
surveying instr	1947	Tilting Level Transit Type G				civil
telephone	1937	Nikko portable optical telephone for battlefield				Army
telescope	1913	Fuijj Lens Seizo-sho refractive type telescope				
telescope	1908	Tokyo Keiki telescope	1 Inch x 16			Navy
telescope	1913	Tokyo Keiki telescope	75			Navy
telescope	1913	Fujii Lens Seizo-sho refractive-type telescope				
telescope	1920	small model			2 Inch, 3 Inch	Navy
telescope	1922	astronomical use, casse grain type reflection				civil
telescope	1922	astronomical use			4 Inch	civil
telescope	1922	astronomical use			6 Inch	civil
telescope	1922	10 centimetre reflector				refractor
telescope	1922	5 centimetre reflector				refractor
telescope	1922	50 centimetre reflector				refractor
telescope	1931	astro telescope for Tokyo Sience Museum	8 Inch			civil
telescope	1935	Masto-telescope model 95	2800		3x, 5x, 7x	civil
telescope	1935	Celostat for Imperial University of Okaido	30			civil
telescope	WWII	Artillery telescope				MK-93
telescope		6.5cm Telescope type 2				Navy
vertexometer	1947	dioptometer				

9. Conclusions

Nippon Kogaku was born with two parents, these were Mitsubishi and the 3 firms who merged. As Godfather there was the Imperial Japanese Navy.

During the 1920s, 1930s, and through the immediate post World War Two era, there is an support of optical firms by the Imperial Japanese Navy. The reason for this support for optical munitions can be found in the Washington Naval Limitation Treaty of 1922 and the subsequent London Naval Treaty of 1930 arguing that the root of Japan's early optical research and development initiatives is to be found in Japan's compensatory Naval Supplementary Bill of 1930. Nippon Kogaku's technical advances made in the furtherance of Imperial Japanese Navy projects, give a good starting point manufacturing in the post war occupation period. In building upon its significant wartime technical breakthroughs and mass production processes, Nikon was able to capture post war consumer optical markets both at home and abroad by the late 1950s.

Nippon Kogaku could start in 1917 with 200 employees because of the high selling of Fujii Brothers based binoculars. Nippon Kogaku could start immediate after the World War II because of the huge demand for binoculars.

The high quality of optical glass production and coating was gained by producing periscopes for submarines.

The high quality of precision mechanical devices was gained by producing the 15 meter rangefinder for the Yamato Class ships and the coupled shagekiban (fire-control unit), an mechanical device to calculate accurate gun-sight values for the turret.

The high quality of mass production by production line producing was gained by producing huge numbers of binoculars during the first years of the 1930's.

10. Justification

In this publication I make use of material of others. As I found a lot on internet you will not find the text published on internet, but just the link to that text.
There is also a lot of material accessible via collectors, in particular on telescopes and microscopes. See the news groups oldscope&yahoogroups.com and the news group binocular list at http://www.europa.com/~telscope/binotele.htm

In this publication one may read two different opinions on the same subject. Quotations of all authors may be found in the appendix.

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1. Research

Museums: For research and pictures of early Japanese and Dutch optics I visited the following museums:

National Science Museum, Ueno Park, Tokyo, Japan;
JCCI Camera Museum, Tokyo, Japan;
Teylers Museum, Haarlem, the Netherlands;
Boerhave Museum, Leiden, the Netherlands;
Rijksmuseum voor Volkenkunde, Leiden, the Netherlands.

2. Used books

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