



Rediscovering the Art of Manufacturing

English Guidebook Version



A Journey through the Industrial Heritage of the Chubu Region

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INTRODUCING JAPAN'S CHUBU REGION THROUGH ITS INDUSTRIAL HERITAGE

By Kotaro TANAKA, President of the Chubu Society for the Industrial Heritage

Situated geographically in East Asia, Japan is surrounded on all sides by oceans. Its neighboring countries include Russia, China and Korea. Japan is comprised of four large islands and some smaller islands, and its area of 380,000 square kilometers has a population of 120,000,000.

The Chubu region is located approximately in the center of Honshu, the largest of the four main islands. On either side of the Chubu region lie the capital city of Tokyo to the east and the cities of Osaka and Kyoto to the west.

Japan's commerce is structured around the importing of energy resources, industrial materials, and food from various countries, and the exporting of high-quality technological products such as automobiles and electrical machines.

The Chubu region as defined in this guidebook will be composed of the five prefectures

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of Aichi, Gifu, Mie, western Shizuoka and southern Nagano. Among these, Aichi, with a population of 6,900,000, is the largest prefecture and is the major center of industry, with automobile production leading the way. Thus, many of the places you will find in this guidebook are located in Aichi.

The major industries by prefecture are: for Aichi, automobiles, steel, aircraft, machine tools, textiles and porcelain; for Gifu, cotton and wool fabrics and porcelain; for Mie, petrochemical products and automobiles; for Shizuoka, motorcycles, musical instruments, paper, and tea; and for Nagano, precision instruments such as cameras and watches.

The Chubu region has played a pivotal role in the development of Japan's industry into what we know it to be today. The origins of this development can be traced through industrial heritage, examples of which will be introduced in this guidebook.



The History of Chubu's Industrial Technology as Told by its Heritage: Rediscovering the Culture behind Manufacturing

By Shoji ISHIDA



The origins of our present-day manufacturing can be traced back to the Bakumatsu-Meiji period. The transition from the Edo Era to the Meiji Era not only was accompanied by huge political, economic, and social changes, but also served as an important turning point in technology. Put simply, this was a period that witnessed the transition from the age of tools to the age of machines.

The technology that was developing in Japan during this time of transition to machines can be divided into the following three types: (A) The first was the kind of technology that was developed by innovative domestic Japanese inventions, as exemplified by the Garabo spinning machine. (B) The second was a transplantation of technology that came from the Industrial Revolution of the West, such as spinning and weaving machines, railroads, and power plants. This type of "transplanted" technology comprises a major portion of Japan's modern technology. (C) The third was a combination of traditional Japanese and Western technologies, to form a "semi-Western" style, examples of which would be thread-making machines and automated looms. The Tataki technique as employed by Japanese plasterers in the making of artificial stone in large-scale construction works such as breakwaters and lock gates, is an example of a "semi-Western" technique in the field of civil engineering.

In addition to these, there is another type of industrialism that went through not changes so much as a unique creative twist to traditional skills or techniques. Examples of this would be sake distillation and the technologies used in the traditional kiln.

Transplanted Technology vs. Technology Unique to Japan

With the advent of the Meiji Era, the textile industry became the core industry. In the field of spinning, the government-run Aichi Spinning Mill (at which there is an Industrial Heritage Monument), and subsequently the Mie Spinning, Shimada Spinning, and Nagoya Spinning Companies, employed what we can say are transplantations of Western-style spinning techniques. They used large steel machines called mule spinning machines which ran on water wheels and steam engines as their power source. All of the machines were imported.

On the other hand, Japan prides itself in having the Garabo spinning machine, invented by Tokimune Gaun, which is the only one of its kind in the entire world. Not long after the Garabo spinning machine was introduced to the public in the Domestic Industrial Exposition in 1877 and received first prize for critical acclaim, it proliferated to all the cotton-manufacturing areas over the entire nation. The Yahagi River area became the center of Garabo spinning, boasting the highest production nationwide. This was partly due to the fact that the Garabo spinning machine was made of wood, and required only basic technical skills to reproduce and build. It can be said that during the interim after hand spinning and before the Western methods of spinning became completely established within Japan, this Garabo spinning technique, which was in effect an automation of hand-spinning, played an important role in this industry. We can see two interesting facts when we view the path that Garabo spinning took in terms of the history of industrial technology.

One of these facts is that immediately after Tokimune Gaun's invention, spinning technology saw an explosive development over only a few years' time. If we consider the gain in popularity of these machines, it stands to reason that there was a large group of technicians capable of producing these Garabo spinning machines over this short period of time.

The other fact is that this technology, despite its having been invented in 1877 and having experienced a decline in popularity, still lives on to the present day. It is extremely rare for a technology that was developed in the Meiji Era to be alive today. The Garabo spinning technology makes us question ourselves as to what it was about this machine that makes it so universal, and also teaches us that perhaps change should not always be equated with progress.

From "Semi-Western" Technology to Technology Unique to Japan

Although Western-style spinning techniques were a fine example of "transplanted" technology, the looms used for weaving the threads employed techniques that blended those of the East and West. Onto the traditional Japanese looms were affixed an English invention called the Battan, or shuttle. Then the looms became pedal-operated, and later became power-operated. These power-operated machines were already in use in the West, but were made entirely of steel. In contrast, the Japanese power-operated looms started out with having a wooden frame. Sakichi Toyoda contributed greatly to the development of the power-operated looms. Sakichi continued with the development of his automated loom, and in 1924 his son Kiichiro succeeded in perfecting the model so that it would be more practical. This invention placed the Japanese loom-making technology to rank among the highest in the world. The success in this field would later lead to the establishment of Toyota Motor Company.

It needs to be mentioned here that the pedal-operated looms served as a transitional stage in this scenario. The pedal-operated looms tell us that, much like the Garabo spinning machines, they, too, were in operation over a long period of time. It is evident that wooden looms were also in use for a long time in rural communities, even up to the end of the Second World War. The

significance of these pedal-operated looms in terms of the history of industrial technology is another topic that requires further study.

From the Meiji to Showa Eras, the acquisition of foreign currency was centered around not only spinning but also silk thread production. Although the government-run Tomioka Thread Production Plant's technology was a direct import from France, there gradually developed machines that were more suited to the Japanese environment, such as the Suwa-type reeling machine, and these led up to the development of the unique multi-purpose reeling machine.

Electricity, Railways, and Steel Production

Of the technologies that were transplanted during the Meiji Era, the ones that concern us directly in our daily lives are electricity and railways. The roots of Chubu's electric supply lie in the founding of Nagoya Electric Light Company in 1889. It was the fifth of its kind in Japan. The technology used in power stations of course required machinery that was imported. The first type of power stations employed steam, but soon they were replaced by hydroelectric power stations. Large-scale hydroelectric power stations such as Nagaragawa Power Station, Yaotsu Power Station, and Ooi Power Station were constructed in the upstream regions of the Nagara and Kiso Rivers. Furthermore, in 1912, Toyohashi Electricity built the Nagashino Power Station, which employed a vertical shaft system of electricity generation called the Niagara Type. The equipment used at this power station utilized the highest technology available at that time for generating hydroelectricity.

As a result of demand, the development of electric supply enterprises gave rise to steel production utilizing the electricity that was being produced. The electric arc Heroult-type furnace which was used in steel-producing companies was designed by a Japanese called Tsunesada Samukawa, and was a domestically-produced technology. The furnace, which is preserved to this day, contains telltale signs of Samukawa's trials and tribulations.

The electric supply enterprises were closely related to the development of railways. Nagoya Electric Railway began operations in 1898 and was an electrically-powered railway system. The construction of the rails also required new engineering techniques. The Ibigawa Bridge and the Onibuchi Bridge are excellent early examples of this type of steel bridge-building.

The supply of electricity also made possible the birth of many industries and technologies other than steel production and railways. Perhaps the most representative example for the Chubu region is the production of insulators. The rapid development of the insulator industry can be explained by the fact that this region was home to the prolific kilns of Seto, Tokoname, and Mizunami, thus transforming traditional ceramics technology into an innovative technology. Today, NGK Insulators, Ltd. boasts the highest level of production and technology worldwide, and is an indispensable member of the electrical industry.

Visiting the Relics of Industrial Heritage in the Kingdom of Goods Production

Today, the Chubu region, consisting of Aichi and the five prefectures of Nagano, Gifu, Mie, and Shizuoka surrounding it, is number one nationwide in many areas of industrial production. For instance, according to the statistics from 1997, Aichi Prefecture's GDP was 1% of that of the entire world, surpassing even those of entire nations with middle-level GDPs, such as Australia and Sweden. We can safely call Aichi the kingdom of goods production. It is important to keep in mind, however, that this status was not achieved overnight.

The transplantation of various technologies from the West marked the Meiji Era, and these technologies were gradually altered to suit domestic needs to become entities independent of their foreign origins. This independence led to greater significance being placed upon the field of engineering. Where was the power that drove this development in engineering coming from? This book attempts to answer this question by following the footsteps of the efforts and labors of our forefathers as we learn about our industrial heritage.

The course that Japan's industrial and technological development took in the Twentieth Century can be said to be an important event in world history. As you will see in each chapter herein, Chubu's industrial heritage eloquently tells us the historical facts behind this development. If we can elucidate the characteristics of the course of formation of these industrial technologies in not only the Chubu region but also the whole of Japan, we should be in a better position to help other countries, especially those developing countries which view Japan as a model, in their efforts to achieve economic success.

Let us learn from the past, cherish the treasures of our homeland, and use the historical facts, the teachings of industrial heritage, to help us create an ideal society for the future.

Chapter 2 Water as the Essence of Life

The modern system of waterways in Japan took its present form in 1887, the year water provision was commenced for the Yokohama Waterways, as a step taken to curb the spread of cholera. The design for this system was completed by an Englishman, Henry Spencer Palmer, with the help of Japanese engineers. Palmer was involved with the waterways in Osaka, Hakodate, Tokyo and Kobe, and he was responsible for laying the groundwork for Japan's present-day waterworks system.

In the Chubu region, a forest agriculturalist from Kuwana, Mie Prefecture, started water supply operations in 1904. In Toyohashi City, a waterworks system for military purposes was created in 1908. Nagoya City appointed an Englishman called William K. Burton for surveillance prior to the construction of its waterways. The construction took fifteen years to complete, and in September 1914, the Kiso River began its task of supplying water to the city. The water supply and drainage systems in Handa, Gifu, and Okazaki Cities became established soon afterwards. Japan's modern drainage system, on the other hand, took its present form for the first time in the foreigners' residential districts of Kobe and Yokohama. Cholera was already a widespread epidemic, and sewerage was becoming an important social issue in 1900, when the Drainage Act was enacted. This law obliged every city, town and village to set up a drainage/sewerage system. In 1930 Nagoya City became the first in Japan to employ the Active Sewerage Law to establish a sewerage treatment plant in Horidome and Atsuta. Toyohashi City followed suit in 1935 with its Noda Sewerage Treatment Plant. This plant was the first in Japan to make use of the Machine-Assisted Sewerage Treatment Act.

(Tadashi OHASHI)

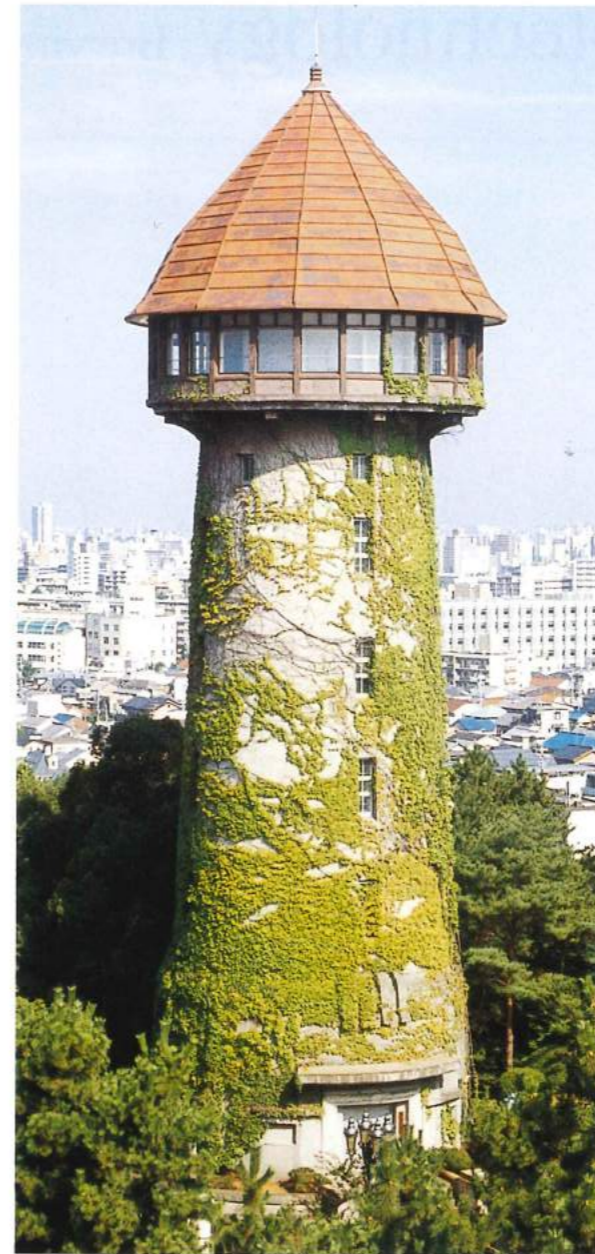


7 The first pump house of the Nabeyaueno Cleaning Bed, built in 1914. It was Nagoya's first water purification facility.



10

The Inabaji Water Tower, built in 1937, a cylindrical structure with a diameter of 33 meters and a height of 29.47 meters, and supported by sixteen cylindrical pillars.



8 The Higashiyama Water Tower, with a height of 87.85 meters (altitude 85.15 m), was built in 1930 and provided water to the first pump house of the Nabeyaueno Cleaning Bed.



9 The Takayama Cleaning Bed, the first such facility in the Chubu region, built in 1908 for military purposes. It can be seen today in its original state, with the old Japanese Army insignia on a steel lid.



11 The turbo-blower and motor used in the revolutionary Japanese process called the activated sludge method, housed in Horidome Drainage Plant which began operations in 1930.



12 The Noda Drainage Plant, which began operations in 1935, still in operation today with the original pump house, first and final pools for floating matter deposits, and clarifier.

We have been consuming many kinds of fermented foods over a long period of time—Sake, Mirin, vinegar, Miso, soy sauce, pickles, and Natto (fermented soy beans), to name just a few. These foods are brought to life through the actions of microorganisms that are living around us. In so doing, they provide depth and variety to the food we eat, give complexity to the tastes we experience, and are responsible for creating the distinctive cuisine flavors that differ from region to region. Fermented foods have traditionally been dependent on the producers' experience and intuition for their taste. It is only with the recent incorporation of Western scientific research into the field of brewing that various problems relating to the brewing process have been solved, making mass production possible. The Tokai region has for a long time been the leading region for brewing industries. Chita Peninsula in Aichi Prefecture, and Mino and Hida in Gifu Prefecture have long been sites of sake production, passing down their sake-making traditions from the Edo Era on to the present day. This was made possible because of the high-quality rice and plentiful underground water in these areas. In Handa in Chita Peninsula, the by-product of sake production, known as Sake-kasu, was used to start the vinegar-brewing industry, in the early 19th Century.

This by-product, which would have been thrown away under any other circumstances, was thus reused to make an entirely different product. Mirin production was also started at around this time in Oohama Village (presently Hekinan City) in Nishi Mikawa, Aichi Prefecture. Also, Miso fermentation, which utilizes soybeans, has been conducted in Aichi Prefecture in Okazaki in the Nishi Mikawa region, and in the Taketoyo region in Chita Peninsula.

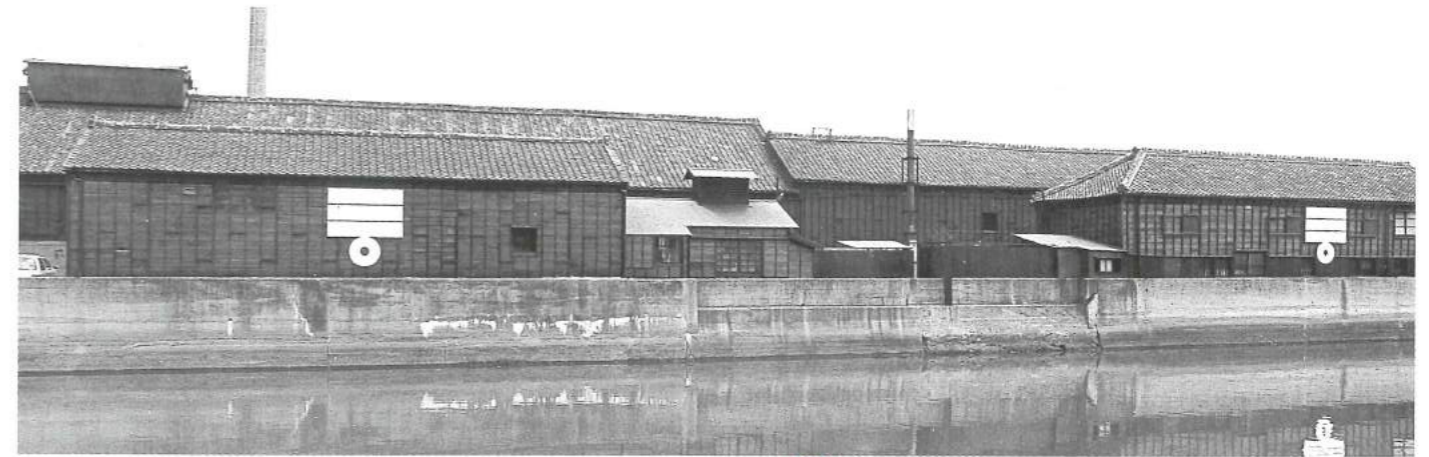
(Seiji TAKIMOTO)



13 The Kunizakari Sake Culture Museum of Nakano Breweries, a 200-year-old, two-storied black-boarded brewing cellar.



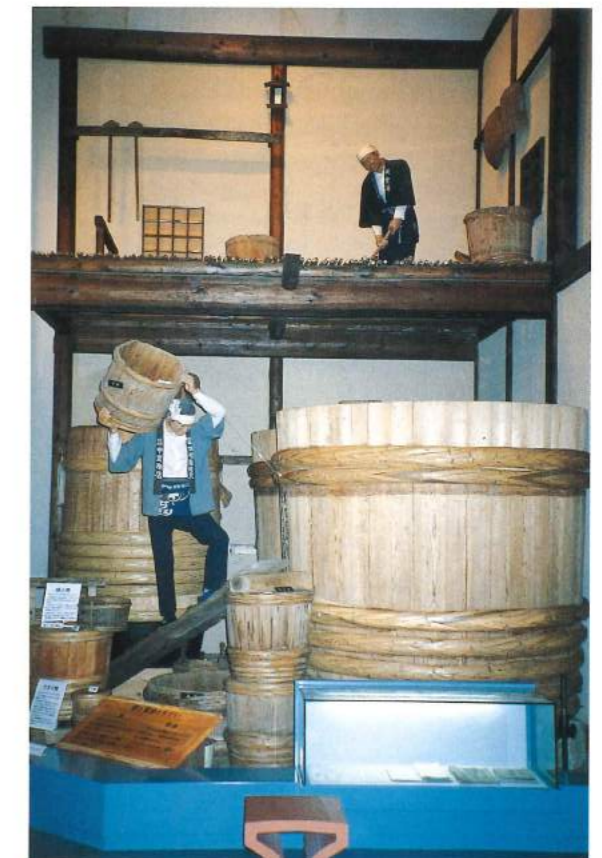
16 Various types of apparatus used in the Mirin-making process, on display at the Kokonoe Historical Museum.



14 Now the Vinegar Museum, the brewing cellar of Nakano Vinegar Co., where in 1804, Matsuzaeemon Nakano brewed the first vinegar from rice cake.



15 Jakan, an apparatus with a long coiled pipe that is heated to 60 degrees, and through which newly distilled sake is sent for the disinfecting process. Displayed in the 300-year-old Matsuiya Sake Manufacturing grounds.



18 A view of the main cellar of Nakasada Shoten, established in 1879, restored to portray the sake- and soy sauce-making processes in the Meiji Era.

17 A view of the inside of the fermentation cellar for Hatcho-Miso in the North Cellar of Maruya Company. The wooden Miso tub holds 6 tons of ingredients, for a total weight of 10 tons with the stones piled on the lid.

Aichi Prefecture's Tokoname and Seto regions are two of the six major "old kiln areas" of Japan. Together, they form the center of the pottery industry because of their proximity to each other and their prolific and high-quality output. Another name for pottery in Japanese is "Setomono", which is derived directly from Seto City's name and is indicative of how productive the city was. Tokoname flourished as the producer of earthen pipes. A look at the old kilns that were being used in Seto and Tokoname reveals that over the last hundred years, many changes have occurred in oven techniques and the fuel used therein.

Furthermore, glaze production and the production of clay ingredients, which were industries that supported the pottery-making of Seto and Tokoname, were being carried out in the Sasaraki River bed region of Mizunami City, Gifu Prefecture, and in the Sanage mountain range in Toyota City, Aichi Prefecture. Numerous trolleys driven by water wheels could be seen in these areas at one time, but now there are only a very few remaining in the Sasaraki River bed region.

Hekinan and Takahama Cities in Aichi Prefecture are leaders in the nation's roof tile production. The kiln used to bake them, called the Daruma kiln, has also undergone numerous improvements throughout its long history. It was replaced after the war by the Tunnel kiln, which employed a technology that could produce a successive flow of tiles, thus leaving behind no actively working Daruma kilns today.

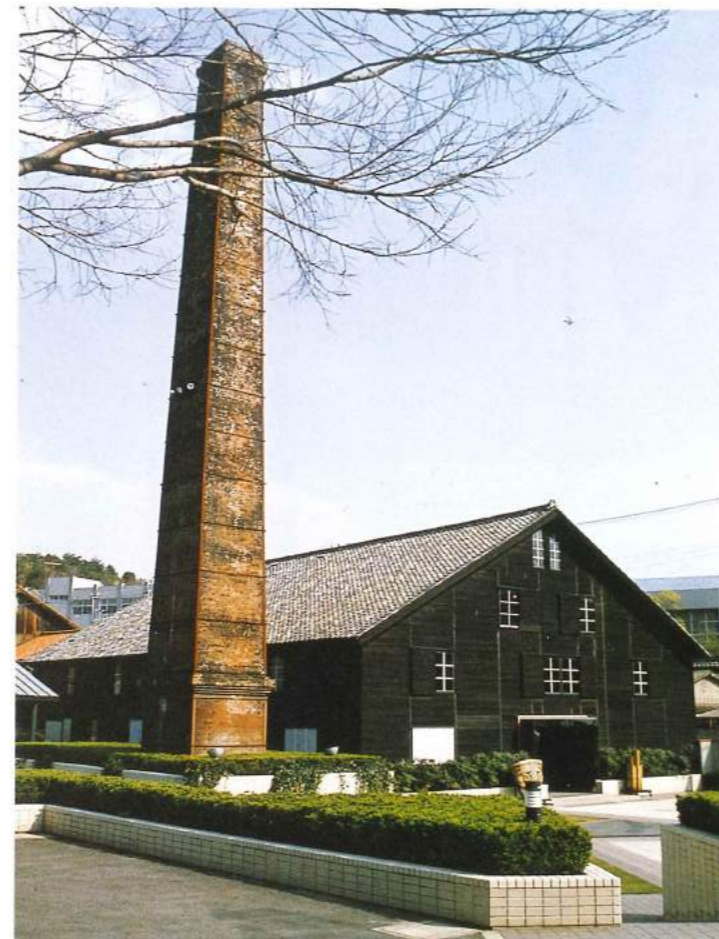
With the advent of the Meiji Era, a new type of kiln-produced product was introduced. The large amounts of calcium ore that were available in Tahara Town in Atsumi Peninsula started to be used in the production of Portland cement. This marked the beginning of the third cement-making industry in Japan, and employed a new type of kiln called the Tokkurigama.

The production of bricks as materials to be used in civil engineering and construction began in Kariya, Anjo, Hekinan, and Toyohashi, with the result that Aichi Prefecture is presently responsible for producing 50% of the nation's bricks, and is the number one brick producer in Japan.

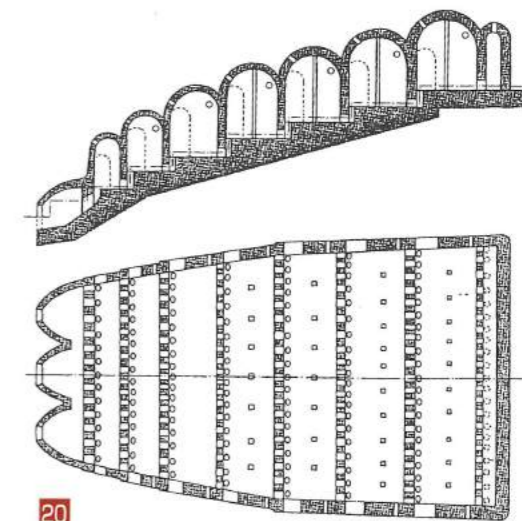
(Shoji ISHIDA)



19 Accessory chimney of Hora Kiln, in Seto City, in use from 1949 to 1979.



21 Kiln Plaza and Museum with its 21-meter brick chimney and rectangular kiln, housed in a 3-storied warehouse with a frontage of 15.5m and a depth of 23m. It was built in around 1921 and was designated as a Registered Cultural Asset in 1997.



20 Cross-sections of the Hongyogama, one type of Noborigama. Articles of ceramics and porcelain were baked in this large-scale kiln, which was composed of numerous chambers constructed on an incline. The flame would shoot up along this incline through the holes connecting each of the chambers at the bottom.



22 Interior of the limekiln in Kiln Plaza and Museum, built in 1921. With a frontage of 5.5 m, depth of 11 m, and height of 3.4 m, this kiln produced earthen pipes for 50 years.



23 The Darumagama in Takahama City, built in 1923. For 70 years it produced the roofing tiles known as Sanshu-Gawara. Designated as a Traditional Cultural Asset in 1999.



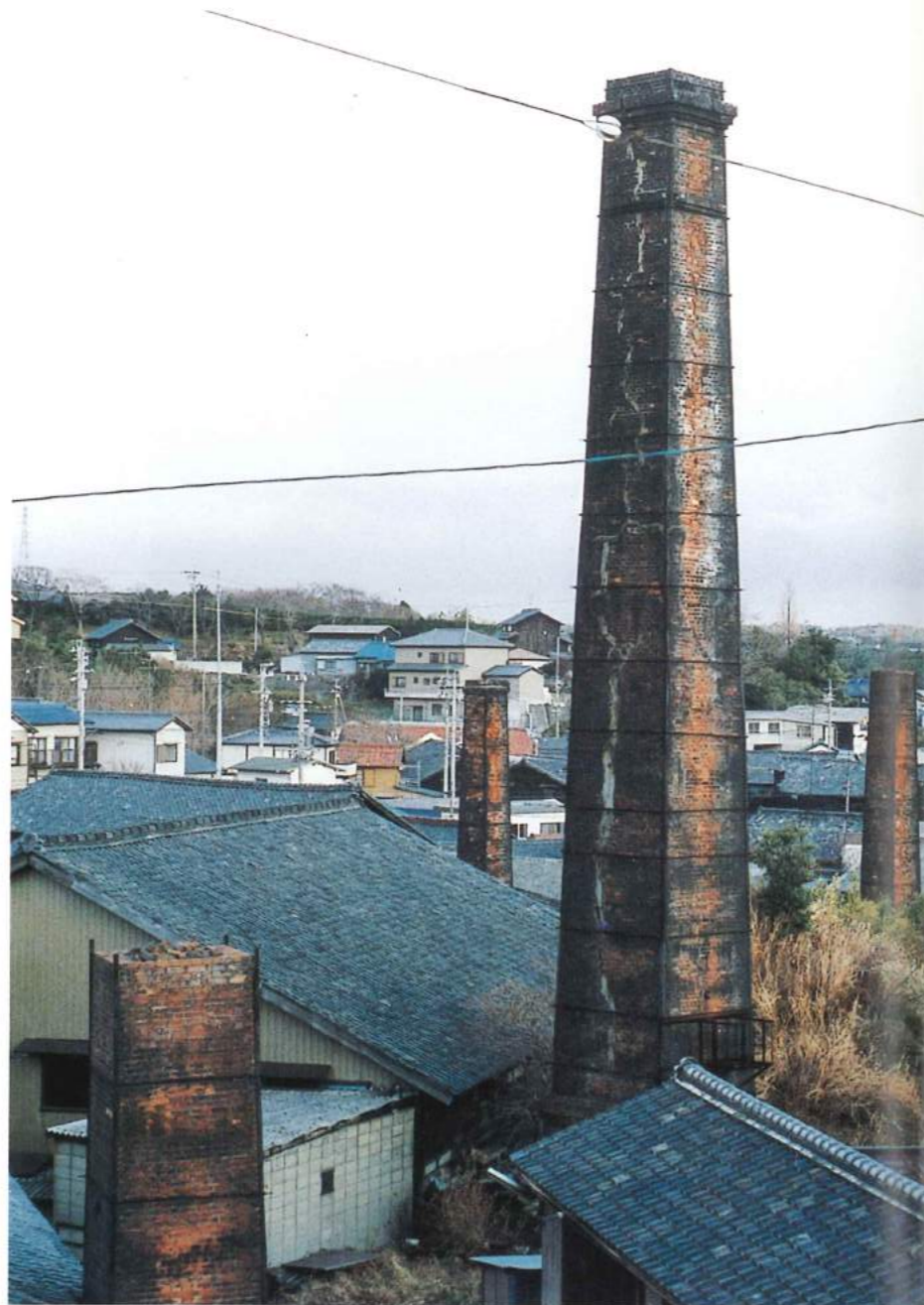
24 Remains of the Tokkurigama, in use from 1889 to 1924 to make cement, seen on the grounds of Mikawa Cement Company.

At first glance, all bricks may look alike. But as they are furnace-baked products, no two bricks are ever the same. If you look at many brick buildings, you will find numerous differences in the way the bricks are produced and piled on top of one another. Brick production in the Chubu region began in 1878 with the Kintozan bricks, the name coming directly from the name of the kiln used by Hoju Koie, a ceramist in Tokoname, Aichi Prefecture. Hoju, famous as the inventor of earthen pipes, originally intended these bricks to be used in his own kilns. The next factory that produced bricks in this region was Toyo-Gumi, a company established in 1882 and which had brick-making factories in Nishio and Kariya. This brick-making tradition, still extant, is responsible for making Aichi Prefecture the supplier of 50% of the nation's bricks.

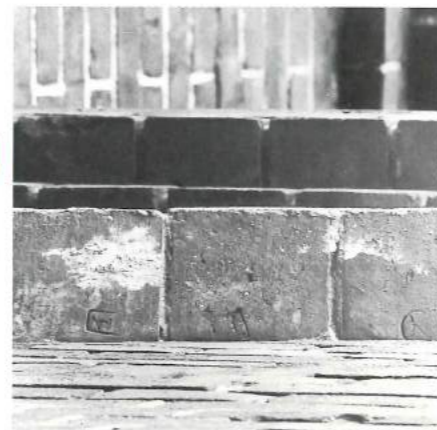
Historically significant brick buildings in the Chubu region can be seen in Chita Peninsula and Nagoya City in Aichi Prefecture; in Shimada City and the upstream region of the Ooi River in Sizuoka Prefecture; in Ogaki City and Sekigahara Town in Gifu Prefecture; and in Yokkaichi City in Mie Prefecture. These buildings are in fact factories that are involved in such industries as pottery, fermentation, chemicals, electricity, and textiles.

Ascertaining the age of a brick building involves learning about not only the age of the bricks used but also the method in which they are stacked together. The dimensions, colorings, condition of the finished surface, and the stamp mark are four checklist points to be covered for each brick. To assess the age of the overall building, we must learn about the following three points: the method of stacking, the color of the adhesive used to connect the bricks, and the type of materials used for reinforcement of the overall structure.

(Shintaro MIZUNO)



25 The brick chimneys used in the production of Tokoname-yaki are symbols of Tokoname City's 900-year history as a site of ceramics production.



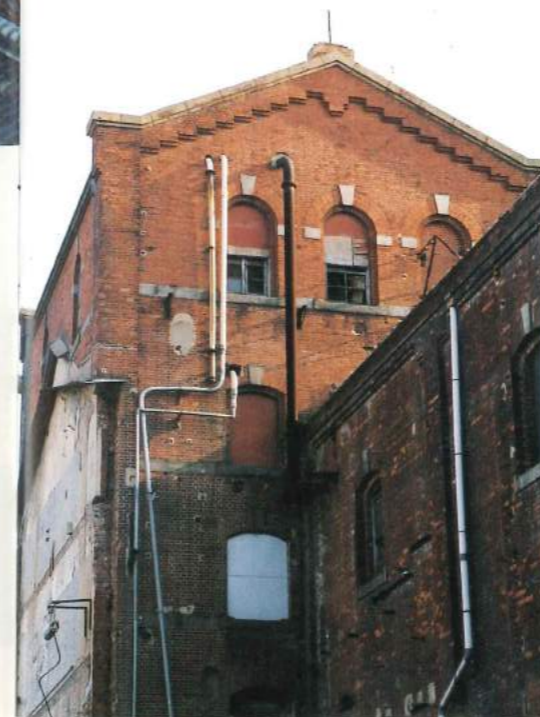
28 Before mass production of bricks began in 1889, each brick was order-made, with inscriptions such as the Japanese letter "イ".



26 Cluster of 10 chimneys at Toueigama, a Noborigama built in 1887 in Tokoname and now designated as an Important Cultural Asset.



27 Still remaining after Noritake Company Limited's founding in 1904, the old clay treatment factory is a three-storied brick building with a tiled roof that houses a trommel, or a clay mixer.



29 The old Kabuto beer factory building, built in 1898 during the golden age of beer production, is a five-storied brick building.



30 The Kitakawa Manufacturing Company building, situated near the Ooi River, is a brick structure that was built between 1898 and 1935 which was used for dry distillation of wood.

The first electric company of the Chubu region, Nagoya Electric Light Company, started operations in 1889, and was one of the pioneers of Japan's lighting industry.

The Chubu region, with its central location within Japan, has as its rooftop a vast mountainous district. With this as the source, many rivers flow down the mountains with enough water volume and speed to merit utilizing them for generation of hydroelectricity. The hydroelectricity industries that sprang up in this area have for many years been leading Japan's hydroelectricity technology and businesses.

Also, the Chubu region was the sphere of action for Momosuke Fukuzawa (1868 – 1938) and Yasuzaemon Matsunaga (1875 – 1971), who were the most influential persons in the electric power businesses. Fukuzawa was known as the "King of Electric Power" due to his being responsible for one-quarter of the nation's electricity. Matsunaga was known as the "Demon of Electric Power" through his efforts in developing electricity enterprises.

NGK Insulators, Ltd., famous as a leading world-class company in the field of insulators manufacturing and insulation technology of electric power systems, has its headquarters here in the Chubu region.

The Chubu region thus has greatly contributed to the nation's development of electricity, and today industrial heritage attesting to this fact can be seen in numerous places throughout this region.

(Tetsuo FUJIMURA)



31 The Yomikaki Power Station, built in 1923, has an output of 40,700 kw and utilizes water from the Kiso River. It has been designated as an Important Cultural Property.



33 Generator house of the Nagashino Power Station, with Japan's first vertical-axis type generator, 1912. The generator could be used in areas with very little altitude difference, and it soon spread nationwide.

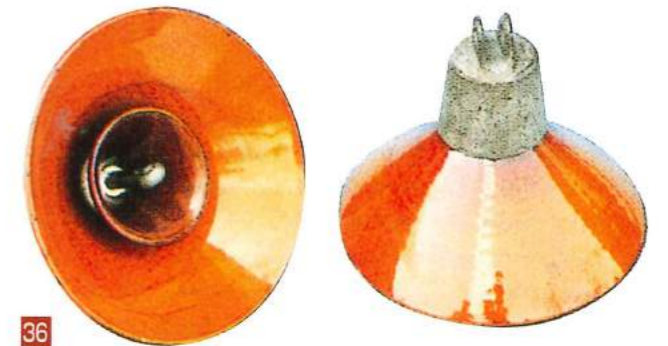
35 Rotor to steam turbine at Meiko Power Plant (1939~1982). The length of the driving axle is about 10 meters, and the largest diameter is about 3.7 meters.



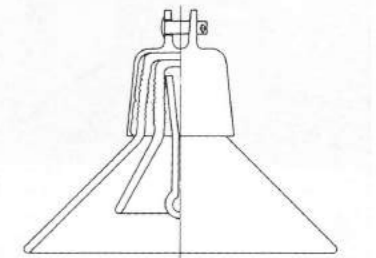
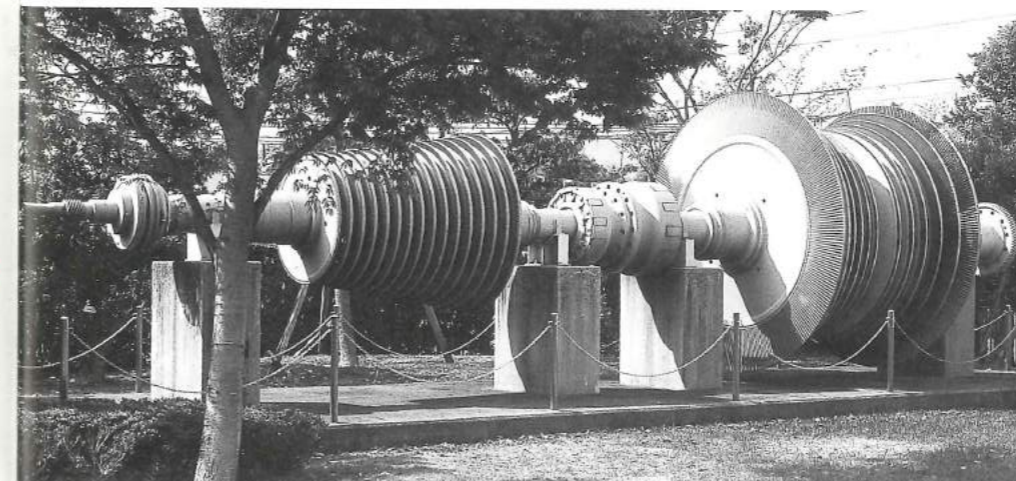
32 The Ooi Power Station, with an output of 42,900kw, and the Ooi Dam, with a height of 53 m, were the largest of their kind when they were built in 1924. Traditional log-rolling down the river was replaced by log transport using the Forest Railways.



34 The First Miyashiro Power Station, built in 1904, is the oldest working power station today. It utilizes a century-old German water wheel and generator.



36 Duncan insulators, the world's first suspension insulators. The original Duncan insulator that was developed in the US in 1903 by Locke Insulator Mfg. Co., is displayed at the NGK Insulators Museum. Suspension insulators are disc-type insulators that are used to insulate the steel tower and the conductor. Several may be used in a row depending on the transmission voltage. Porcelain or glass is used for the insulating part.



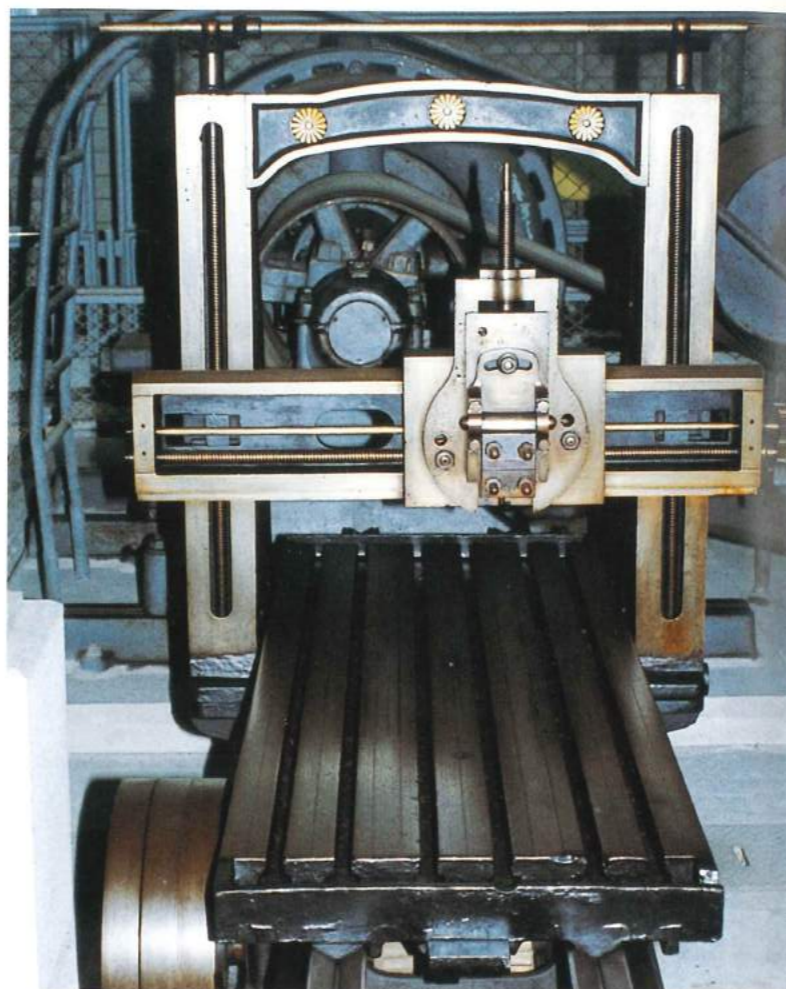
37 Structure of a Duncan insulator.

The major portion of what goes on in factory production is the making of small parts by the use of various machines. Machine tools are used to shape these pieces into the desired forms, such as by shaving curved edges onto metal pieces, adding grooves, and punching holes. These machine tools include lathes, planers, shapers, milling attachments, drilling machines, and grinding machines.

Without the high-precision machines to make these parts, we cannot expect to obtain high-quality products after assembly. It stands to reason, then, that an entire nation's level of machine technology is directly connected to how accurately the machine tools can do their job. The level of Japan's machine tools is now one of the highest in the world; but this was not a feat that was accomplished overnight. It happened first by learning from the machines that were imported from Germany and America, and then by developing domestically-produced machines that improved upon them.

Presently, in Aichi and Gifu Prefectures, we have three of the nation's top-level factories that manufacture machine tools: Ookuma, Yamazaki Mazak, and Toyota Manufacturing Companies. These three companies are not the only machine manufacturers; for instance, Brother Company, which manufactures specialized machinery, and Toyota Automatic Looms, which manufactures operational machines, are only two of countless such companies in the Chubu region. All of these companies contribute to making the Chubu region the center of industrial production, with, of course, automobile production at the pinnacle.

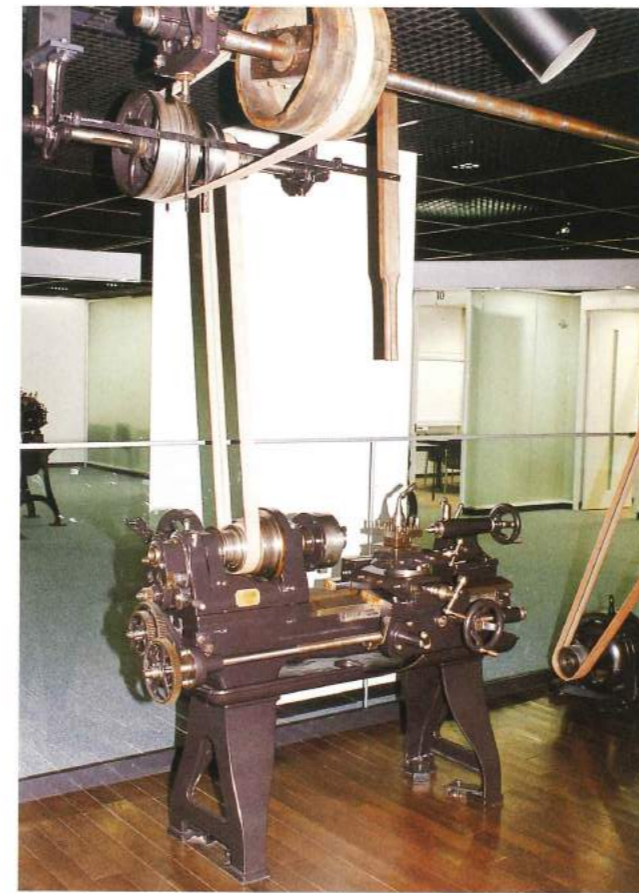
(Shoji ISHIDA)



38 A planer with the chrysanthemum crest, indicating its being manufactured by the Meiji government in 1879. The length of the table is 2060 mm, and the width is 1165 mm.



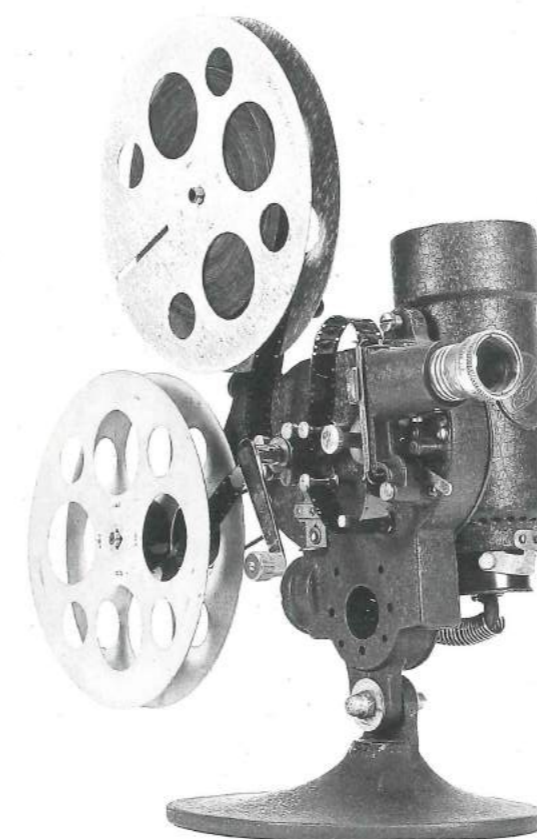
39 Oldest existing Inokuchi-type volute pump in Japan, built in 1912.



41 The belt-employing lathe, the oldest (1932) and origin of all the lathes produced by Yamazaki Mazak Company.



40 The Economical High Speed Lathe, manufactured by Ookuma Company in 1958, on display at the company's Kani plant.



43 The A Type 16-mm Elmo Projector, the first domestically-produced film projector, was completed in 1927 by the company's founder, Hidenobu Sakaki.



42 The first Brother sewing machine for home use, completed in 1932 by the company's founders the Yasui Brothers, a result of many years of research and hard work.

Japan's first radio communication took place in 1897 by Matsunosuke Matsushiro, a technician at an electricity testing center, as a communications experiment conducted between Tokyo and a ship at sea. After the First World War, the Japanese government encouraged radio communications with people overseas in an effort to promote diplomacy and commerce. Thus in 1927 the Yosami Radio Transmitting Station, a long-wave radio station, was established in Kariya City, Aichi Prefecture, and the Kaizo Receiving Station was built in Yokkaichi City, Mie Prefecture. Telecommunications with European countries was commenced in 1929, with Poland being the first country with which it took place.

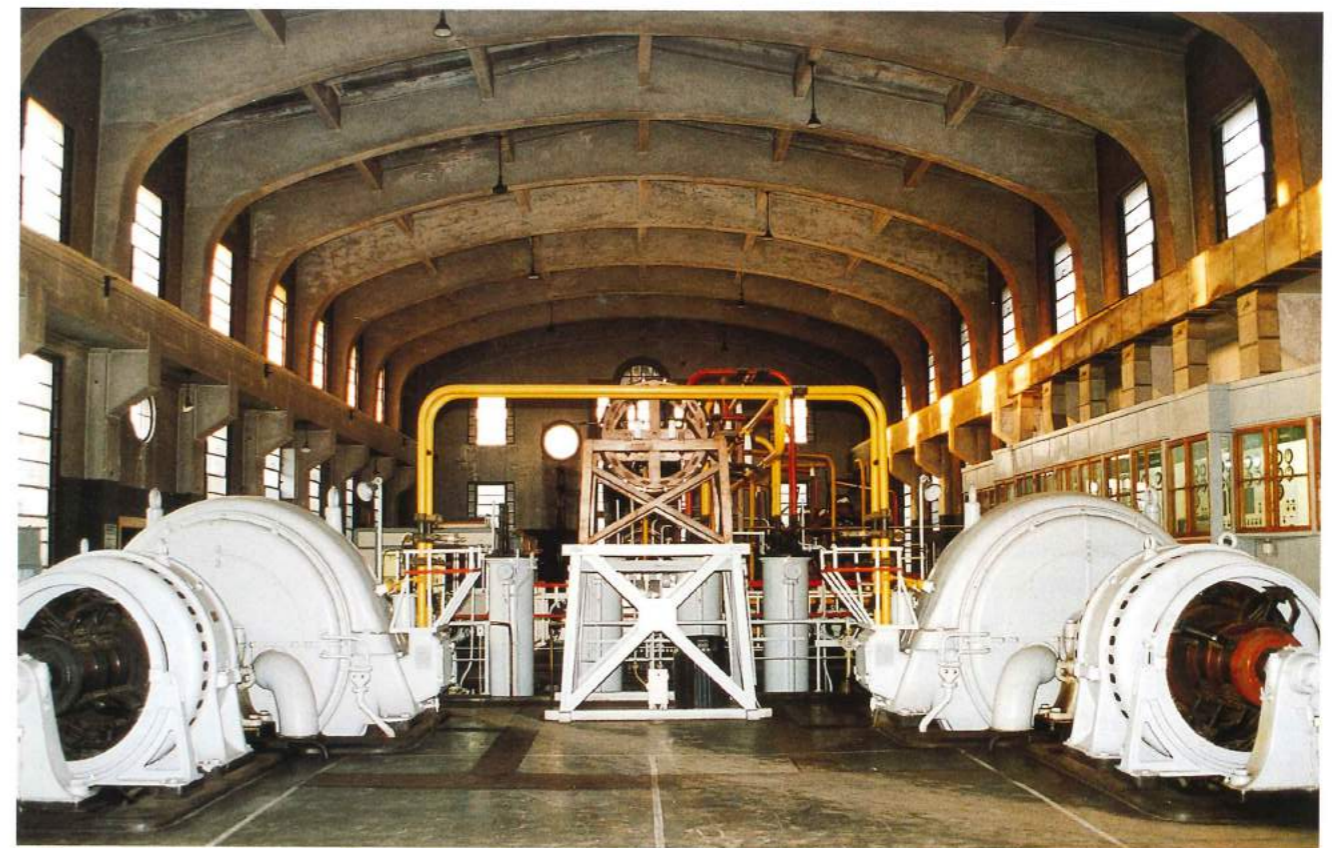
As a rule, wireless communication is conducted on a person-to-person basis; however, the receiving end may be plural if there is a plural number of receivers. This type of communication, when it is transmitted to a large number of unspecified persons, is known as broadcasting. In March 1924, Tokyo Broadcasting Co. (the present NHK) transmitted its first radio broadcast from Tokyo's Mount Atago. As for commercial broadcasting, Chubu Nippon Broadcasting Co. (Nagoya City) was the first, starting operations in September 1951.

Sending a visual image together with the sound results in television. Television is now an indispensable medium, providing information on politics, economics, culture and daily life, and its emergence has created what we now call the culture media. The roots of television lie in the electronic television system, which was perfected in 1926 by Kenjiro Takayanagi.

(Shoji ISHIDA)



50 Yosami Radio Transmitting Station, where the first radio communication between Japan and Europe took place in 1929.



51 Interior of the transmission home of Yosami Radio Transmitting Station, with transmission machines imported from Germany.



52 Monument of the first televised word "イ" to applaud the efforts of Kenjiro Takayanagi, the first person to develop electronic television technology in the world.



53 Takayanagi's first iconoscope, which employed his theory of transforming light from an image into electrical signals through the use of a condenser. He was successful in 1935 in using the iconoscope to capture an outdoor image onto a cathode-ray tube. Displayed at Takayanagi Memorial Museum.

54 The first color television camera made entirely from transistors, built in 1962 by Chubu Nippon Broadcasting Company.

Chapter 10 Iron and Steel – the Staplefoods of Industry

Japan's first iron manufacturing was conducted in 1909 by Choubei Tsuchihashi, who utilized the electricity from the Miyashiro Hydroelectric Power Plant in what is now Shimauchi, Matsumoto City. Although the plant was closed down during the Depression in 1929, its role as the precursor for steel production is very significant. In 1916, Nagoya Electric Light Company (presently Chubu Electric Company) started an electro-iron-making plant in Nagoya City, which made use of excess electricity produced from the Kiso River Power Plant (presently Yaotsu Power Plant). Tsunesada Samukawa, the chief engineer at this company, upon request by the president, Momosuke Fukuzawa, designed an electric arc furnace for the production of ferroalloys and alloy tool steel. This enterprise formed the base for what would today be known as the special steel manufacturers, and encouraged the development of Chubu's heavy chemical industries. In 1940, Toyota Motor Company, having recently become independent from Toyoda Automated Loom Manufacturing Company, established a company that would provide special steel material for automobiles, called Toyota Steel Company (presently Aichi Steel Company). In this way, the iron- and steel-producing industry in the Chubu region was characterized by the production of special steel through the use of electricity. In September 1964, Tokai Steel Company (presently Shin-Nittetsu Nagoya Steel Manufacturing Plant) in Tokai City, Aichi Prefecture, started operations of its Number One High Furnace, marking the beginnings of modern iron and steel production in the Chubu region. Furthermore, along the Kinuura Coastal Industrial Sector sprang up Kawasaki Steel Company (Handa City) and Nakayama Steel Company (Taketoyo City), forming what would be known as the Pacific belt of steel suppliers. The emergence of this modern form of steel production has facilitated the acquisition of the raw materials to be used in iron and steel production.

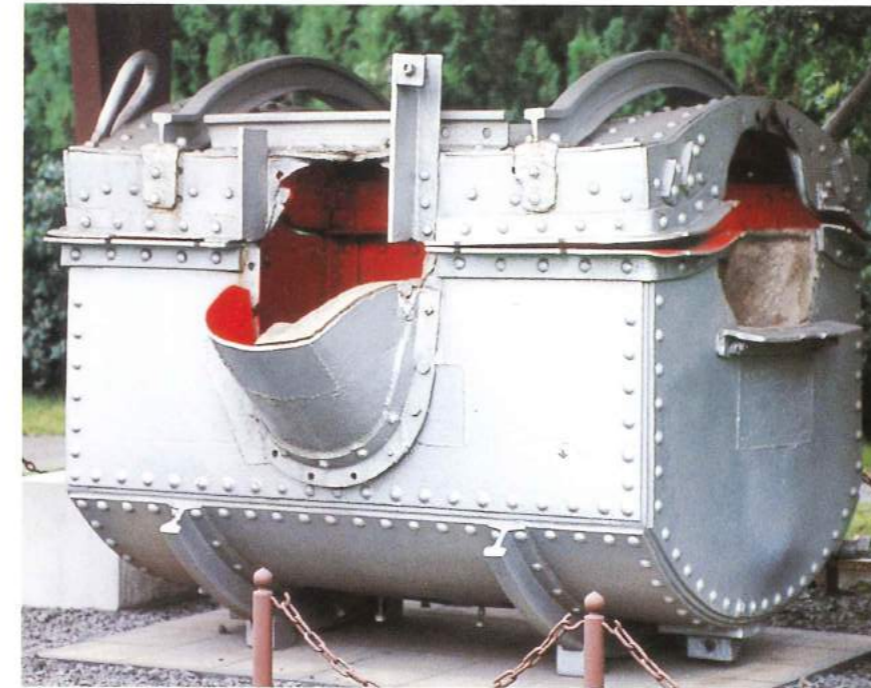
(Kenjiro NAKAZUMI)



58 The cogwheel has a diameter of 4.2 meters and weighs 65 tons. It was used from 1937 to 1961, and is now preserved at Chubu Kohan Company.



57 Giant deceleration cogwheel on rolling machine used for steel flattening.



55 Furnace shell for the electric arc Heroult-type furnace, capable of producing 1.5 tons of steel and stored at Daido Special Steel's Chita factory.



56 The high-manganese alloy crossing rail, built in 1948 by Daido Steel for the Chuo Line of Japan National Railways and laid in Ochanomizu Station.



59 Paper Ema, or religious drawing, depicting bronze-casting techniques being used in the making of a bell for a Buddhist temple. It was donated to Ishinji temple in 1881.



60 Bronze-cast temple bell, one of only a few which were not melted down for wartime efforts. The diameter is 1.5 meters, and the height is 2.9 meters.

The major mineral mines developed in the Chubu region are the Kamioka Mine in Gifu Prefecture and the Kune and Toi Mines in Shizuoka Prefecture. Also, it was in Sagara Town, Shizuoka Prefecture, that the single oil field on the Pacific Coast was located.

During the Edo Era, Japan boasted a high level of domestic production of copper, gold, and silver, and these formed the major portion of its exports. The mineral mines in the Izu region, as represented by the Toi Mine, were responsible for supplying these metals. At present, a part of the Toi Mine can be accessed as a tunnel for tourists.

The Kamioka Mine produced zinc, lead, and copper, and was one of Japan's major mines. The relics remaining include the mine entrance, built in the Meiji Era, the ore-dressing site, and the mine railway, as well as a power plant as a related facility.

The Kune Mine was an important copper mine. Today, its relics include its mine entrance and ore-dressing grounds.

The Sagara Oil Field was the first machine-dug oil field in Japan. It ceased operations in the late 1950's, leaving behind one oil well.

(Takehiro AMANO)



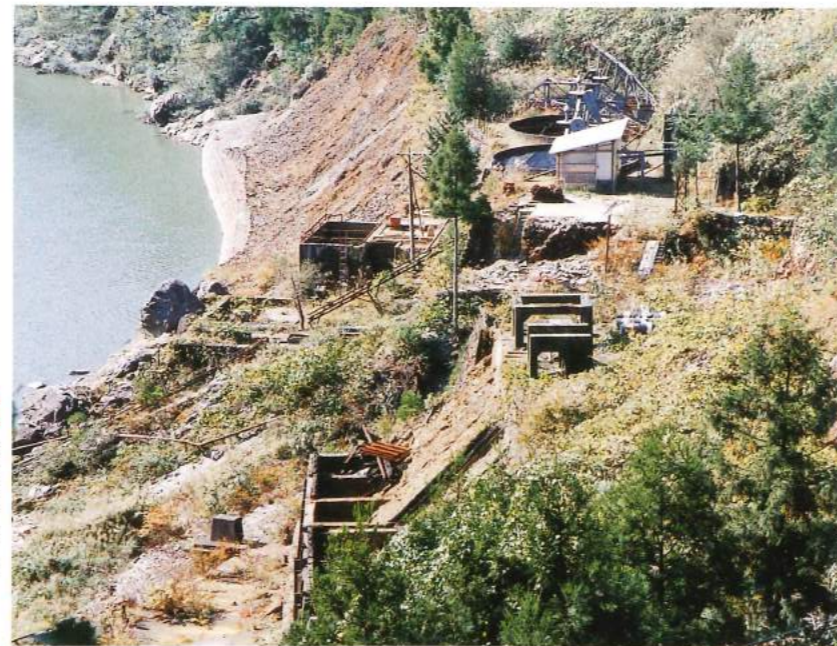
61 Pot for removal of copper slag from cooled raw lead, used in the purification of lead. This machine was installed in 1924 at Kamioka Mine, and was used continuously up through 1968.



64 The Dorr thickener used at Kune Mine, which stirred and caused sedimentation of the copper-ore pulp to alter its solid density.



62 Drifters displayed at the Mining Museum in Kamioka Town.



63 Remains of the ore-dressing site of the Kune Mine, a copper-ore mine situated along the midstream region of the Tenryu River. This and other facilities of the mine can still be seen today.



65 Sagara Oil Field, the only oil field on the Pacific side of Japan and producing oil for 80 years from 1873, is known as the pioneer of machine-drilled oil wells.



66 Machines and tools used at Sagara Oil Well.

Tataki is a traditional Japanese plastering technique. The materials used are Masa soil and slacked lime (calcium hydroxide), which are mixed with water and kneaded well. The material thus produced is administered with sticks, pounded, and layered, one on top of another. It was a technique often seen in old houses' entranceways and foyers. Artificial stone is Tataki embedded with natural stones on the surface (these are called "floating stones"); this provides added strength to the overall structure. Large-scale civil engineering projects make use of this artificial stone technique.

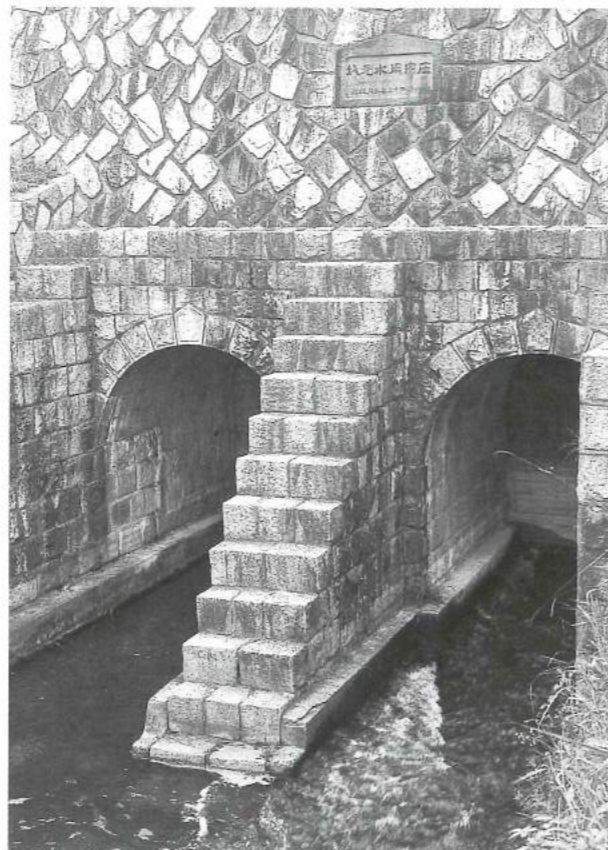
Artificial stone absorbs carbon dioxide and becomes as hard as the limestone it came from. In the years before cement became popular, it was widely used as a civil engineering technique.

The man who devised this scheme of artificial stone was Choshichi Hattori of Aichi Prefecture, who was responsible for creating the display areas and fountain in the 1881 Exposition. Construction employing artificial stone was conducted all over Japan, in places such as breakwaters for ports, seawalls, sluiceways, and water gates.

At present, it has been confirmed that there are 64 civil engineering sites throughout the nation in which the artificial stone technique has been employed. Among these, many of them are found in Aichi, Gifu, and Mie Prefectures. There are 26 structures still existing in this area which employ this technique.

Artificial stone blends well with natural pieces of broken stone, and in seawater it becomes even stronger. One hundred years after its perfection, the technique can still be seen in its original form all over Japan.

(Tadashi OHASHI)



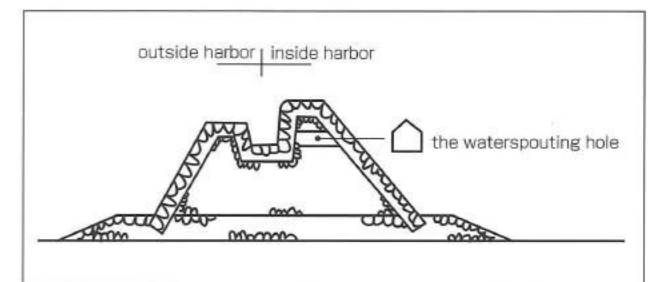
72 The Shonaiyosui-Motoirihi Sluiceway, built in 1910, made use of Sanshu-Tataki techniques which have rendered the sluice virtually undamaged to the present day.



69 Weir of the old head works of the Meiji-Yosui irrigation channel (presently Yahagi River in Toyota City), built by Choshichi Hattori in 1909 and completed with artificial stone techniques.



67 Designated as an Important Cultural Asset in 1996, the old Yokkaichi Port's breakwater was constructed in 1894 by Choshichi Hattori and is characterized by small holes from which water is allowed to spout.



68 Cross-sectional diagram of the old Yokkaichi Port's breakwater.



70 The No. 5 Watergate of Muro Sluiceway, made from artificial stone in 1894.



71 The Goroku Sluiceway, built in 1907. It is composed of two arches and steel doors that closed automatically when the water level at the downstream region became higher than that on the other side of the doors.

The construction of railways was indispensable for the modernization of industry. The first railroad was opened in 1872 using English technology; it connected Shinbashi and Yokohama. In 1889, the Tokaido Line, connecting Tokyo and Kobe, was completed. The major points of difficulty in the construction of this railway were the bridges that needed to be built over the three Kiso rivers, the Tenryu, the Ooi, and the Fuji Rivers.

The bridges constructed over the Ibi, Nagara, and Kiso Rivers employed long pillars that were placed 200 feet apart and made of wrought iron double Warren trusses. The original bridge that was constructed over the Ibi River is still being used today as a road bridge. Afterwards, the nation's first steel bridges were constructed over the Fuji, Ooi, and Tenryu Rivers.

Modernization of industry was closely linked with the development of hydroelectricity. The Chubu region, being blessed with large rivers, prided itself in being number one nationwide in terms of electric output. Hydroelectricity generation required the construction of structures such as dams, aqueducts, and electricity transmission facilities. In the mountain ranges there are still bridges remaining that are made of concrete and steel that had been used to carry raw materials during the construction of the hydroelectric power stations.

There are three canals in Nagoya City. The Nakagawa Canal was opened in 1930 as a water route connecting Nagoya Station and the port.

Railways were constructed in the port in order to transport cargo. Ships and railways were allowed to coexist by means of railway drawbridges; one was built in Nagoya Port and another in Yokkaichi Port. The drawbridge in Yokkaichi Port is still working today.

(Tadashi OHASHI)



92 The Matsushige Gateway was completed in 1932 to connect the Nakagawa Canal and the river Horikawa. Since the water level in Horikawa is higher than that in the Nakagawa Canal, ships were passed through the gateway while adjustments in water level were being conducted. Two of the towers support the winding apparatus that is used to open and close the 40-ton doors to the gateway. At one time, the gateway passed 90,000 ships per year, but with the increase in truck transportation, it was forced to cease operations in 1968.



73

This railway drawbridge, connecting 1- and 2-Gochi of Nagoya Port, was used from 1928 to 1986. With the canal being 54 meters wide, the movable portion was 16.5 meters long and was drawn up over a period of two minutes.



74 The old Yokkaichi Port Railway Bridge, built in 1931, is the oldest working drawbridge in Japan. The 26.6-meter movable portion is drawn up through a system of ropes and pulleys over a period of one minute 20 seconds.



77 Tsuge Bridge is an open-arch bridge made of reinforced concrete and has long pillars connecting the bridge and the arch portions. Built in 1918, it is a beautifully designed bridge.



75

The Ibigawa Bridge, built in 1887 with the help of an Englishman, was transformed from a railway bridge to a road bridge. It has 5 trusses and 61 meters between the pillars.



78

The entrance to the Nakagawa Canal and the lock gate at the mouth of Naka River. The canal, with a length of 8.2 km, was completed after four years, in 1930. The peak of commerce along the canal was in 1964.



79 Sendohira Lock, built in 1902, allows the passage of 100 to 500 fishing ships and leisure boats per year.

The Mino region is an area whose altitude is exactly sea level; it is where the three rivers of Kiso, Nagara, and Ibi meet to flow into Ise Bay. Plentiful water nourishes the rice paddies and provides numerous gifts to people's lives. Yet, too much rain and floods can cause tremendous damage to crops and threaten the livelihood of the people. There is a history of battles between water and the people who try to control it. "Man's control of water" is in itself an important enterprise directly connected to preserving the lives of people.

The first water-controlling method devised by the residents of the Chubu area involved the construction of small dikes around each cluster of domiciles, which would prevent the intrusion of water from the large rivers on the outside. However, there were constant disputes among the clusters of domiciles regarding how to drain out the water that tended to accumulate inside. In the Meiji Era, a system was put into effect wherein the three major rivers were separated from each other by means of large dikes, thus preventing water-related damages. This water-controlling enterprise was successful in the sense that damages caused by water were greatly reduced in the Mino region. However, separating the three rivers posed a paradox in terms of water transport of cargo over the existing canals versus the drainage methods used from the inside of the dikes.

To combat the problem regarding water transport of cargo, a canal was built at Sendohira to let ships through; and to alleviate the problem of the accumulation of water on the inside of the dikes, the natural drainage system was changed to a mechanized system that employed pumps.

(Isao TAKAHASHI)



82 Volute pumps, made in 1928, releasing water into the Nagara River at 9 tons per second, were in operation for 55 years.



80 The upstream side of the Tatsuta-Waju Draingate, built in 1901.



83 The old vertical-axis Umori drain pumps, built in 1936, were in operation for 40 years. They were run by diesel engine (300 hp), and water drainage output was 3.25 cubic meters per second.



84 Volute pumps at the Fukue Drain Pump House, built in 1927, released 1.8 tons per minute of water into the Ibi River. These were in operation for 56 years.



81 The Hanedani Dike, constructed in 1888, is composed of huge stones and serves to prevent rock erosion in times of heavy rainfall. It is 12 meters high and 54 meters wide, the largest of its kind for its time.

Chapter 15 Fruits of the Oceans and Mountains

The coasts of Aichi Prefecture's Mikawa Bay and Ise Bay produced a large portion of the nation's seaweed. Seaweed production, which began in the latter half of the Edo Era, was mechanized in the late 1950's and early 1960's, but in the ensuing decade it reached its demise due to the landfill projects that were carried out. The tools from the manual-harvesting age as well as the machines that were used subsequently are preserved in museums in these areas.

The mountainous regions of Chubu, with their plentiful forests, have from long ago been the sites for lumber production. Museums in the valleys house the tools and machinery that were used to cut the wood, carry it down the rivers (rafts), process it, and shape it. Also, along the rivers in several places, we can see the remains of sawmills that had been run on the power generated by water wheels.

From the Edo Era onward, this region saw the avid production of Washi, or Japanese paper. Western paper production that used wood pulp began around the mid-Meiji Era. In Haruno-cho, Shizuoka Prefecture, there are the remains of Japan's first Western paper factory. The old office building of this company, a brick structure, is now being used as a museum. In Fuji City, Shizuoka Prefecture, where a large cluster of paper-manufacturing factories sprang up soon afterwards, there are museums and other facilities that preserve the early paper-manufacturing machines and tools.

(Takehiro AMANO)



86 The "Fuji-Maru," the only remaining Utase whaling ship that is of the Aichi-Prefecture type, in use from 1955 for twenty years.



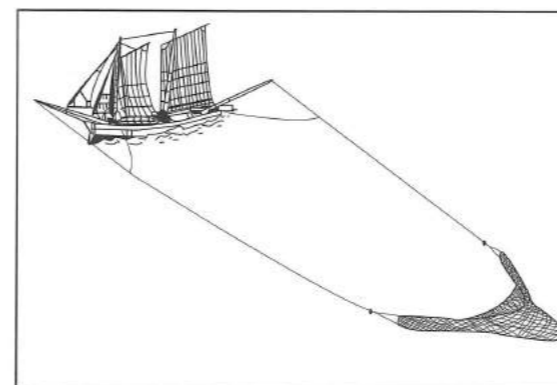
89 The Kagurasan, an apparatus used in the Hida region for hoisting the wood onto and off of the rafts, much like today's winch.



85 Semi-automatic seaweed thinning machine, built in 1955 and displayed at the Toyohashi Folklore Museum.



90 Ooji Paper Manufacturing Co.'s Keta factory, which started to make chemical pulp by treating wood with chemicals in 1889. The office for the factory is this "red brick building", as it is fondly called. It is now the Haruno-cho Historical Folk Museum.



87 Diagram depicting the method of Utase fishing, in which the net is thrown into the water to catch a large number of fish. After 1962, it was no longer the mainstream fishing method.



91 The American-made cutter, made in 1890, for cutting rolled paper into sheets, used at the Iriyamase factory of Fuji Paper Manufacturing Co..



88 Japanese fishing boats displayed at the Sea-Folk Museum. There are 51 ships displayed, including 13 that are Important Cultural Assets.

Access Maps

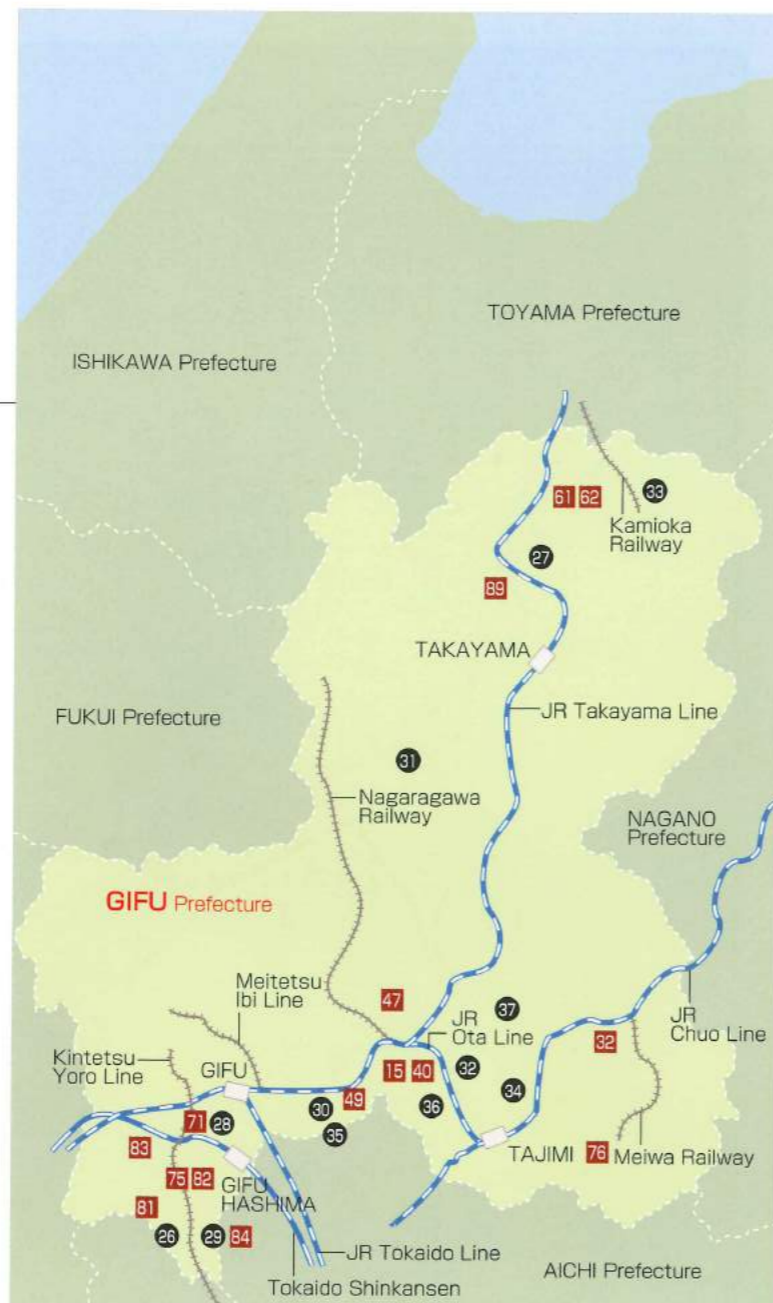
GIFU Prefecture

- 26 Crystal Sugar Museum
- 27 Forestry Museum of Hida
- 28 Hashima City Film Museum
- 29 Kaizu Town History and Folklore Museum
- 30 Kakamigahara Aerospace Museum
- 31 Meiho Village Museum
- 32 Meitetsu Museum
- 33 Mining Museum
- 34 Mizunami Ceramic Museum
- 35 Naito Museum of Pharmaceutical Science and Industry
- 36 Ookuma Company's Kani Factory Display of Excellent Machines
- 37 The Old Yaotsu Power Station Collection



MIE Prefecture

- 38 Hakari no Yakata (Scales Museum)
- 39 Iga Braid Center
- 40 Komono-cho Local History Archives
- 41 Matsusaka Municipal Folk History Archives
- 42 Sea-Folk Museum
- 43 The Kiwa-cho Mining Museum



SHIZUOKA Prefecture

- 44 Fuji Municipal Museum
- 45 Hamamatsu Municipal Museum
- 46 Oigawa Railways Steam Locomotive Museum
- 47 Sakuma Rail Park
- 48 Shimizu Bay Museum (Verkehr Museum)
- 49 Takayanagi Memorial Museum
- 50 The Ikawa Collection
- 51 Yamaha Engine Communication Plaza



NAGANO Prefecture

- 52 Forest Railways Museum
- 53 Horigane Village History and Folklore Museum
- 54 Okaya Municipal Cocoon Museum
- 55 Ookuwa Village History and Folklore Museum
- 56 Oomachi Energy Museum
- 57 The Kansai Electric Power Co. Kisogawa Electric Power Museum

AICHI Prefecture

11 Museum Meiji Mura

Built in 1965, this open-air museum boasts an area of one million square meters, upon which 67 authentic and restored buildings from the Meiji period have been transferred. Many monuments of industrial heritage can also be viewed here, such as the very first tram used in Kyoto, the Shinagawa lighthouse, steel bridges, a sake-manufacturing plant, and Number 9 and Number 12 Steam Locomotives. The tram and trains are used to carry the visitors in Meiji Mura from attraction to attraction.

- 1 Uchiyama, Inuyama City, Aichi Prefecture
- Tel: 0568-67-0314 ● FAX: 0568-67-0358
- Hours: 9:00 AM - 5:00 PM (4:00 PM in November through February)
- Closed: December 31, Mondays in December and January (unless Monday is a holiday)
- Fee: Adults ¥1600, elementary and junior high school students, ¥600.
- Access: From Inuyama Station on Meitetsu Inuyama Line, take the bus bound for Meiji Mura, get off at Meiji Mura.
- URL: <http://cjm.meitetsu.co.jp/meiji-vii/index-j.html>



Number 12 Steam Locomotive in Museum Meiji Mura

12 Museum of Agricultural Folklore, General Agricultural Testing Grounds of Aichi Prefecture

A 3-meter water wheel greets the guests at the entrance to this museum, which houses 1581 monumental agricultural machines of the Meiji, Taisho and Showa Eras, including the automated type A threshing machine "Mizuho" (1926), a pedal-operated straw-mat making machine (1871), and a tea steaming machine used in the tea-making process. The tools and machines displayed here are not only educational, but also tell us how ingenious the rural people of Aichi were.

- 1-1 Mitsugamine, Iwasaku, Nagakute-cho, Aichi-gun, Aichi Prefecture
- Tel: 1561-62-0085 ● FAX: 0561-63-0815
- Hours: 10:00AM - 4:00PM
- Closed: Saturdays, Sundays, National holidays, Dec. 29 - Jan. 3.
- Admission: free
- Access: 20 minutes by Meitetsu Bus from Fujigaoka Station (Higashiyama Line), get off at Prefectural Agricultural Testing Grounds. Reservations requested for groups.
- URL: <http://www.pref.aichi.jp/nososi/index.html>

13 Museum of Vinegar "SU-NO-SATO"

Handa City is known as the "City of Cellars," with Sake, vinegar, Miso and soy sauce cellars lining the wharf of Kinuura Port. This museum, which was started in 1986 by Nakanosumise, the renowned vinegar-brewing company, is itself situated in the cellar in which the founder made vinegar for the first time. Three hundred utensils, including mixing paddles, a bucket in the shape of a fox's face, and compressor vessels are displayed here to introduce visitors to the vinegar-brewing process of the Edo Era.

- 2-6 Nakamura-cho, Handa City, Aichi Prefecture
- Tel: 0569-24-5111 ● FAX: 0569-24-5018
- Hours: 9:00 AM - 4:00 PM
- Closed: The 3rd Sunday, New Year's holidays
- Admission: free
- Access: From Chita Handa Station on the Meitetsu Kowa Line, a 10-minute walk to the east. Phone reservations required.
- URL: <http://www.mitsukan.co.jp/sapari/edomae/vol3/sunosato.htm>

14 Nagoya Aerospace Systems Manufacturing Company Museum of Mitsubishi Heavy Industries

Located adjacent to Nagoya Airport and on the grounds of the South Komaki factory of Mitsubishi Heavy Industries, this museum takes us through the technological changes that were made in Mitsubishi aircraft from 1920 by means of displays of machinery, airplanes, generators, and resources relating to the development of each aircraft. The Type 52 Zero Fighter Plane (1943) on exhibit here was salvaged and restored from ruins; the rocket fighter plane "Shusui" is scheduled to be fully restored in 2001.

- 1 Hoba, Toyama-cho, Nishikasugai-gun, Aichi Prefecture
- Tel: 0568-28-1112
- Hours: 9:00 AM - 4:00 PM
- Open to the public on Mondays only
- Admission: free
- Access: From Meitetsu Bus Center take Airport Express Bus, get off at the domestic terminal, a 10-minute walk to the west; or from Nishiharu Station on Meitetsu Inuyama Line, take direct bus to domestic terminal, a 10-minute walk to the west. Reservations required.
- URL: <http://www.das.co.jp/gaiyou/traffic.html>

15 Nagoya Airport Aerospace Museum

Located on the third floor of the domestic terminal, this museum features the Type 32 Zero Fighter Plane, the Mitsubishi MU-2A miniature multipurpose plane, a gyroplane, and an H-1 rocket engine. The Type 32 here is unique in that it is a transitional model with shortened, pointed wings, having been designed for greater acceleration (as it turned out, at the expense of flight duration). It was found in the Marshall Islands by an American, brought back to Japan, and fully restored for display.

- Hoba, Toyama-cho, Nishi-kasugai-gun, Aichi Prefecture
- Tel: 0568-28-1221 (airport), 0568-28-6367 (direct)
- Hours: 9:00 AM - 5:00 PM ● Closed: Never, open year-round.
- Admission: Adults ¥500, junior and senior high school students ¥300, children ¥200.
- Access: From Meitetsu Bus Center, take Nagoya Airport Express Bus, get off at domestic terminal; or from Nishiharu Station on the Meitetsu Inuyama Line, take direct bus to domestic terminal.
- URL: <http://www.nagoya-airport-bldg.co.jp/>



The Mitsubishi MU-2A miniature multipurpose plane and the Type 32 Zero Fighter Plane in the Nagoya Airport Aerospace Museum.

16 Nagoya City Museum

This museum, which started operations in 1977, the year Nagoya's population reached 2 million, houses 170,000 items related to the history, customs, archaeology, and arts and crafts of this region. On the second floor is displayed Sakichi Toyoda's revolutionary G Type Automated Loom (1924), which enabled the shuttle to be changed without stopping the machine. It is said that he sold his patent for this machine to Platt's in England for 100,000 pounds in 1929 to make funds for his future Toyota Motor Corporation.

- 1-27-1 Mizuho-dori, Mizuho-ku, Nagoya
- Tel: 052-853-2655 ● FAX: 052-853-3636
- Hours: 9:30 AM - 5:00 PM (final entrance 4:30 PM)
- Closed: Mondays (Tuesday if Monday is a holiday), the 4th Tuesday, December 29 - January 3.
- Admission for the permanent exhibition: Adults ¥300, university and high school students ¥200, junior high school students and below free.
- Access: From Sakurayama Station on the Sakuradori subway line, come out of Exit 4, a 3-minute walk to the south.
- URL: <http://www.ncm-jp.com/>

17 Nagoya City Science Museum

Situated in Shirakawa Park in central Nagoya, this science museum utilizes experiments and models to help us experience scientific technology first-hand. As for industrial heritage, this museum houses the B6 steam locomotive, the 1400 Bogie Tram, the Francis-type runner used at the Ooi Power Plant, and Japan's first tape recorder. The three items other than the tape recorder are displayed out in the open, within the confines of the park.

- 2-17-1 Sakae, Naka-ku, Nagoya
- Tel: 052-201-4486 ● FAX: 052-203-0788
- Hours: 9:30 AM - 5:00 PM
- Closed: Mondays (Tuesday if Monday is a holiday), the third Friday (the fourth Friday if the third is a holiday), New Year's holidays
- Fee: Adults ¥300, elementary and junior high school students free, outside displays are free.
- Access: From Fushimi station on the Higashiyama Line, a 5-minute walk to the south.
- The open-air displays can be viewed at all times.
- URL: <http://www.ncsm.city.nagoya.jp/index.html>

18 Okuyahagi Pumped Storage Power Station Museum

Situated in the upstream region of the Kuroda River, a tributary of the Yahagi River, the power plant located adjacent to this museum has a maximum output of 1,095,000 kW. The museum not only teaches the theory behind hydroelectric power generation, but also displays the historical (1916) Francis-type runner from England, generator, and penstocks which were in fact used by one of Chubu Electric's hydroelectric power plants up to 1987.

- Oosuibetsu, Odagi, Inabu-cho, Kita-shitara-gun, Aichi Prefecture
- Tel: 05368-2-3087
- Hours: 10:00AM - 4:00PM
- Closed: Mondays, the third Sunday of the month
- Admission: free
- Access: From Toyota Station on the Meitetsu Mikawa Line, get on the Meitetsu Bus bound for Asuke (60 min), at Asuke transfer to Inabu Town Bus (30 min), get off at Suibetsu.
- URL: <http://www.chuden.co.jp/okuya-pr/okuya.html>

19 Sewerage Science Museum

This museum was opened in 1989 as part of Nagoya's centennial commemoration. Located on the Meijo Sewerage Treatment Plant grounds, it teaches us about the functions and makings of the sewage system in an enjoyable manner. Outdoors, there are two monumental displays: a 1923 diesel-engine main pump manufactured in Germany, which was used in the Atsuta Pumping Grounds for draining rainwater; and a 1937 drain pump, used in the Rokyō Sewerage Treatment Plant.

- 1-3-3 Meijo, Kita-ku, Nagoya
- Tel: 052-911-2301 ● FAX: 052-911-2301
- Hours: 9:30 AM - 4:30 PM
- Closed: Mondays (Tuesday if Monday is a holiday), December 29 - January 3 ● Admission: free
- Access: From Meijo-koen Station on the Meijo subway line, come out of Exit 1, a 5-minute walk to the west.
- URL: <http://www.water.city.nagoya.jp/gesui/070kagaku/kagaku.html>

20 Taketoyo Local History Resource Museum

This museum depicts the commercialization of Taketoyo Town by introducing the work of the blacksmith, stonemason, dyer, and geta (shoe)-maker. Local tools and agricultural tools are also displayed. The traditional products of this area, namely Miso and thick soy sauce, employ huge tubs dating back to the Taisho Era, and these can be seen here together with how they are used. Also on display here are historical materials on Taketoyo Station and Taketoyo Port.

21 The Kagome Museum

Situated on the Ueno factory grounds of the famed tomato ketchup and Worcestershire sauce manufacturer, this museum tells the story of how tomato-processed products, through repeated improvements, came to become an accepted and integral flavor for the Japanese palate. The machines and other items displayed here give first-hand evidence of the improvements made in tomato cultivation, in the concentration and processing techniques of the tomatoes, and in the packaging of consumer products.

- 108 Higashi-yashiki, Arai-cho, Tokai City, Aichi Prefecture
- Tel: 052-603-1161
- Hours: 9:00 AM - 3:00 PM
- Closed: Saturdays, Sundays, and National holidays
- Admission: free
- Access: From Shin-nittetsumae Station on the Meitetsu Tokoname Line, a 15-minute walk to the east; or from Ootagawa Station on the Meitetsu Line, take the Meitetsu Bus to Teranaka, a four-minute walk to the south. Reservations must be made at least a week in advance.



Rotary double kettle, Kagome Museum

22 Tokoname City Folk Museum

The pottery known as Tokoname-yaki has a history of 900 years. This museum, founded in 1981, displays the finished products as well as the various tools used to make them, such as those for preparing the clay, for molding, and for firing. Videos and slides assist in the understanding of the processes involved and in telling the history of Tokoname-yaki. Archaeological findings from medieval kiln sites, the earliest Tokoname-yaki examples, are also exhibited.

- 4-203 Segi-cho, Tokoname City, Aichi Prefecture
- Tel: 0569-34-5290 ● FAX: 0569-34-6979
- Hours: 9:00 AM - 4:30 PM
- Closed: Mondays, 4th Tuesday, New Year's holidays
- Admission: free
- Access: From Tokoname Station on the Meitetsu Line, take a bus bound for Chita Handa, get off at Okusakae-cho (10 minutes), a 7-minute walk to the north.
- URL: <http://www.city.tokoname.aichi.jp/>



Wooden molds to make earthenware pipes, Tokoname City Folk Museum

- 20-1 Aza Yamanokami, Taketoyo Town, Chita-gun, Aichi Prefecture
- Tel: 0569-73-4100
- Hours: 9:00 AM - 4:30 PM
- Closed: Mondays, holidays, New Year's holidays
- Admission: free
- Access: From Chita-Taketoyo Station on the Meitetsu Kowa Line, a 10-minute walk to the north; or from Taketoyo Station on the JR Taketoyo Line, a 15-minute walk to the west.
- URL: <http://ec-nt.lec.handy.n-fukushi.ac.jp/taketoyo/sisetu/rekimin.htm>

AICHI Prefecture

23 Toyohashi Museum of Natural Resources

Established in 1980 to educate children about underground resources and energy conservation, this museum houses 1300 rare and beautiful stones, 200 tools and machines used in copper and sulfide ore mining in Mie Prefecture's Kishu Mine, a battery-operated locomotive produced by Nichiyu in 1968 to transport people within the mine, and air-operated vehicles used to transport the ore. Outside the building is an air-pressure crawler, an unusual machine which forms a hole in the stone wall.

- 19-16 Aza Hiuchizaka, Ohiwa-cho, Toyohashi City, Aichi Prefecture
- Tel: 0532-41-2833
- Hours: 9:00 AM - 4:30 PM
- Closed: Mondays, New Year's holidays (December 29 - January 3)
- Admission: free
- Access: From Futagawa Station on the Tokaido Line, a 12-minute walk to the west.
- URL: <http://www.toyohaku.gr.jp/chika/>

24 Toyota Automobile Museum

The 120 historical Japanese and foreign cars housed in this museum help us to look at cars not only as machines but also as highly-evolved members of our automobile society. Each spring, the museum has a parade to test run its cars. The addition of a new wing in 1999 has enabled viewers to see the lifestyles of people during the days when the automobile was starting to become a household word. The first Type RS Crown, the revolutionary "people's car," is one of the main attractions in this museum.

- 41-100 Aza Yokomichi, Ooaza Nagakute, Nagakute-cho, Aichi-gun, Aichi Prefecture
- Tel: 0561-63-5155 ● FAX: 0561-63-5159
- Hours: 9:30 AM - 5:00 PM (4:30 PM in November through March)
- Closed: Mondays, New Year's holidays
- Admission: Adults ¥1000, junior high school students ¥600, elementary school students ¥400
- Access: From Fujigaoka station on Higashiyama Line, transfer to Meitetsu Bus, get off at Nagakute depot, a 5-minute walk to the east.
- URL: <http://www.toyota.co.jp/Museum/index-j.html>



The first Type RS Crown in the Toyota Automobile Museum

25 Toyota Commemorative Museum of Industry and Technology

Situated in the birthplace of the famous Toyota Group, this museum is comprised of three historical zones, the themes of which are textile machinery, automobile manufacturing, and "Technoland," which teaches the structure and theory of machinery. Most of the machines on exhibit allow hands-on operation for a firsthand experience in manufacturing. The brick building in which the museum is housed was built in 1911 as a factory for the Toyoda automated loom, and was virtually undamaged in wartime.

- 4-1-35 Noritake Shinmachi, Nishi-ku, Nagoya, Aichi Prefecture
- Tel: 052-551-8115 ● FAX: 052-551-6199
- Hours: 9:30 AM - 5:00 PM (Admission until 4:30)

- Closed: Mondays (Tuesday, if Monday is a holiday), New Year's holidays
- Admission: Adults ¥500, junior and senior high school students ¥300, elementary school students ¥200
- Access: From Sako Station on the Meitetsu Line, a three-minute walk to the southeast.; or from Kamejima Station on the Higashiyama Subway Line, a ten-minute walk to the north.
- URL: <http://www.tcomit.org/>

GIFU Prefecture

26 Crystal Sugar Museum

Since its opening in 1995, the year of Nakanihon Crystal Sugar Company's centennial, this museum, which is situated within the Nanno factory grounds, has been educating its visitors about not only sugar and the manufacturing process of crystal sugar, but also the history of the relationship between people and sweetness. One crystal-sugar-making machine from the founding days has been preserved and is on display, together with a bleaching machine and a decrystallizing machine (1967).

- Nanno Factory of Nakanihon Crystal Sugar Company, 2812-100 Tsuya, Nanno-cho, Kaizu-gun, Gifu Prefecture
- Tel: 0584-57-2711 ● FAX: 0584-57-2163
- Hours: 9:00 AM - 4:00 PM
- Closed: Saturdays, Sundays, holidays
- Admission: ¥300
- Access: From Mino Tsuya Station on the Kintetsu Yoro Line, a 15-minute walk to the northwest. Reservations required.
- Make reservations at: Nakanihon Crystal Sugar Company, 1-1 Tamagawa-cho, Nakagawa-ku, Nagoya; Telephone: 052-661-0115
- URL: <http://www.nakahyo.co.jp/tiikisyakai/siryokan.htm>

27 Forestry Museum of Hida

Furukawa-cho, surrounded by the Hida mountains, has a long history of life and culture based on harmony with the mountains. This museum shows the way of life of the Hida people through 3258 exhibits of their lumbering and woodwork tools. The forestry and lumbering tools include axes, hatchets, sickles and saws, and 562 vehicles and tools for transporting the lumber are shown. The woodwork tools come from such diverse occupations as charcoal-making, cabinetwork, carpentry, and tub-making.

- 2-1-56 Wakamiya, Furukawa, Yoshiki-gun, Gifu Prefecture
- Tel: 0577-73-3288 ● FAX: 0577-73-3288
- Hours: 9:00 AM - 5:00 PM (wintertime: 4:00 PM)
- Closed: Tuesdays, New Year's holidays
- Admission: High school students and up ¥300, elementary and junior high school students ¥150 (common ticket with Furukawa-cho Local Folk Craft Center)
- Access: From Hida Furukawa Station on JR Takayama Line, a 5-minute walk to the north.
- URL: <http://www.gec.gifu.gifu.jp/museum/sanpo/18/index.htm>



The Cylindrical Loom, Toyota Commemorative Museum of Industry and Technology

28 Hashima City Film Museum

In 1996, the Takehana Asahi Movie Theater was converted into this unusual museum, which receives most of its resources from donations and is dedicated to preserving the love for the silver screen. A 1.7-meter-tall Arc-type movie projector greets the visitor; it is a 1947, 35-mm projector donated by an avid movie fan, who had been using it in his theater in Nagano for 12 years until the theater could no longer compete with the popularity of television and had to be shut down.

- 2624-1 Takehana-cho, Hashima City, Gifu Prefecture
- Tel: 058-391-7663 ● FAX: 058-394-0025
- Hours: 9:00 AM - 5:00 PM
- Closed: Mondays (except for the Monday following the third Sunday); the day following a holiday; the third Sunday; New Year's holidays
- Admission: Adults ¥300, children ¥100
- Access: From Hashima Shiyakusho-mae Station on the Meitetsu Takehana Line, a 5-minute walk to the north.
- URL: http://www.city.hashima.gifu.jp/kankou_6.htm

29 Kaizu Town History and Folklore Museum

This museum depicts the efforts made by the residents through history in their battle with their below-sea level location to thrive and leave behind a rich legacy. The open-air exhibits include the following: 1. Artificially-elevated rice paddies devised in the Edo through Meiji Eras; 2. The Inokuchi-type centrifugal pump, manufactured by Ebara Company and in use from 1927 to 1981, and its Meidensha motor; and 3. The diesel locomotive and trolley used in land improvement endeavors from postwar years to the late 1960's.

- 205-1 Kayano, Kaizu-cho, Kaizu-gun, Gifu Prefecture
- Tel: 0584-53-3232 ● FAX: 0584-53-3231
- Hours: 9:30 AM - 5:00 PM
- Closed: Mondays (Tuesday if Monday is a holiday)
- Admission: Adults ¥310, elementary and junior high school students ¥150.
- Access: From Osu Station on the Meitetsu Takehana Line, take the Ochobo Inari Line of Gifu Bus to History and Folklore Museum. The outdoor exhibits are free of charge.
- URL: <http://www.gec.gifu.gifu.jp/museum/sanpo/4/index.htm>

30 Kakamigahara Aerospace Museum

In 1917, Kakamigahara City became the second place in the country to have an airfield. Over 70 different types of aircraft took off from Kakamigahara Airfield, including the Zero and Hien Fighter Planes and the STOL test aircraft "ASKA." The museum here houses a restored Salmson 2A-2 and an STOL, numerous instructional materials on aviation and spacecraft, flight simulator experience, and a tour through actual aircraft restoration. Also, displayed outdoors is a YS-11 passenger plane.

- 5-1 Shimokiri-cho, Kakamigahara City, Gifu Prefecture
- Tel: 0583-86-8500 ● FAX: 0583-86-9912
- Hours: 9:30 AM - 4:30 PM (Open-air exhibit and multipurpose area hours: 9:00 - 5:00)
- Closed: Tuesdays (Wednesday if Tuesday is a holiday), December 28 - January 2
- Admission: ¥1000
- Access: From Kakamigahara Airport Station on Meitetsu Kakamigahara Line, a 30-minute walk to the southeast (10 minutes by shuttle bus).
- URL: <http://www.city.kakamigahara.gifu.jp/museum/index.html>

31 Meiho Village Museum

Founded in 1977, this museum is located in the old Myogata Elementary School schoolhouse, a two-storied wooden building with a tiled roof built in 1937. It houses a collection of 46,000 items relating to life in the mountains. Of particular interest are a foot-pedaled thresher, a water-cooled kerosene engine, and an extremely rare drum-can-shaped pot for dry distillation of pine-root oil, the substance that was to become the substitute for petroleum at the end of World War II.

- 154 Kira, Meiho Village, Gujo-gun, Gifu Prefecture
- Tel: 0575-87-2119 ● Hours: 9:30 AM - 4:30 PM
- Closed: Mondays, days immediately following holidays, and New Year's holidays
- Admission: Adults ¥400, elementary and junior high school students ¥200
- Access: From Gujo Hachiman Station on the Nagarakawa Railways, take Gifu Bus Myoho Line bound for Akeyama for 20 minutes, get off at Citizen's Center, a 10-minute walk to the north
- URL: <http://cscns.csc.gifu.gifu.jp/virtual/5/index.htm>

32 Meitetsu Museum

This museum was opened in commemoration of Meitetsu Railways' centennial in 1994. It is for the most part used as a morale-boosting means to stimulate creativity and as an educational facility for Meitetsu's employees. The Resources Building has two rooms, one of which deals with history, and the other of which houses train parts and machines. A diorama train simulator, an authentic D16 freight car on display, and old signs that had been used at stations are just a few of the many attractions here.

- 1816 Kawai, Kani City, Gifu Prefecture
- Tel: 0674-61-0831 ● Hours: 10:00 AM - 5:00 PM
- Closed: Saturdays, Sundays, New Year's holidays (subject to be closed without notice)
- Admission: free
- Access: From Japan Rhine Imado Station on Meitetsu Hiromi Line, a 20-minute walk to the northeast. Reservations required.
- URL: <http://www.meitetsu.co.jp/meitetsu/rr/shiryokan.html>

33 Mining Museum

Situated on the Kamioka Mine grounds, this museum displays the interesting and historical tools used in the mining of the mountain, such as pots for removing copper slag, barrels containing explosives, auctioning boards, and bellows for metal working. But what catches the eye at the entrance is a black, stick-shaped tool resembling a machine gun; it is the "drifter," the machine that replaced the chisel and hammer by using air pressure to decompose the ore.

- 1-1 Jogaoka, Kamioka-cho, Yoshishiro-gun, Gifu Prefecture
- Tel: 0578-2-0253 ● Hours: 8:15 AM - 4:30 PM
- Closed: Winter (December 1 - March 31)
- Admission: Adults ¥450, children ¥250
- Access: From Kamioka Ohashi Station on Kamioka Railways, a 10-minute walk to the northeast.
- URL: <http://www.gec.gifu.gifu.jp/museum/sanpo/11/>

34 Mizunami Ceramics Museum

Mizunami City, located in the western part of the Tono region, is the birthplace of the type of pottery known as "Mino-yaki." This museum showcases the entire process of Mino-yaki, starting with the processing of raw materials and taking us through the tools and machines that lead up to the finished product. These include clay, glaze, potter's wheels, painting tools, and representative works from each period. The adjacent building houses a wooden water wheel and trommel, and a grinding mortar.

- 1-6 Yamanouchi, Akese-cho, Mizunami City, Gifu Prefecture
- Tel: 0572-67-2506
- Hours: 9:00 AM - 5:00 PM (final entrance 4:30)
- Closed: Mondays (Tuesday if Monday is a holiday), New Year's holidays
- Admission: Adults ¥200, children ¥100
- Access: From Mizunami Station on the JR Tokai Chuo Line, take bus and get off at Shimin Koen Mae, a 4-minute walk to the north. (Shuttle bus service available from Mizunami Station three times a day.)
- URL: <http://www.city.mizunami.gifu.jp/gyousei/kaseki/touji.html>



The waterwheel-operated glaze-making machine, Mizunami Ceramics Museum

GIFU Prefecture

35 Naito Museum of Pharmaceutical Science and Industry

Toyoji Naito, the founder of Eisai Pharmaceutical Company, established this unique museum in 1971 in hopes that it would curb the rapid loss of important historical documents in pharmacology and pharmaceuticals. Starting with the spherical-pill extruding machine, this museum boasts a collection of over 50,000 items, many of which are donations. The library adjacent to the museum holds many historically significant books, and the botanical garden has 600 types of medicinal plants.

- 1 Takehayamachi, Kawashima-cho, Hashima-gun, Gifu Prefecture
- Tel: 0586-89-2101
- Hours: 9:00 AM - 4:00 PM
- Closed: Mondays, December 28 - January 8
- Admission: free
- Access: From Shin-ichinomiya on the Meitetsu Line, take Meitetsu Bus bound for Kawashima, get off at Kawashima-guchi, a 20-minute walk to the east; or, from JR Gifu Station, take Gifu Bus bound for Kawashima-matsukura, get off at Kawashima Gakko-mae, a 20-minute walk to the east.
- URL: <http://www.eisai.co.jp/museum/>



The spherical-pill extruding machine, Naito Museum of Pharmaceutical Science and Industry

36 Ookuma Company's Kani Factory Display of Excellent Machines

In 1998, Ookuma Company started a display corner in its Kani Factory of its products to commemorate its centennial. Noodle-making machines, yarn looms, and machine tools tell the story of Ookuma's footsteps. Noteworthy in particular are the machine tools, the most recent of which is the LM70-AT Turning Center (1980), and the best-selling and most famous of which is the LS Economical High-Speed Lathe, the machine with the durable, high-speed, cemented-carbide alloy blade that is also user-friendly.

- 3-6 Himegaoka, Kani City, Gifu Prefecture
- Tel: 0574-63-5620, ask for Personnel Manager Mr. Yamaki
- Open to the public: 9:00 AM - 4:00 PM
- Closed: Saturdays, Sundays, holidays
- Access: From Shin-Kani Station on Meitetsu Hiromi Line, take bus to Kogyodanchi Kumiai Mae, a 20-minute walk to the south. Reservations required.

37 The Old Yaotsu Power Station Collection

The history of this hydroelectricity power station dates back to 1911, when the Kiso River was first tapped, and 1917, when it began operations with a power of 10,800 kw. It ceased operations in 1974, and left behind these brick and concrete buildings, later designated an Important Cultural Asset. Inside are housed three domestic horizontal-axis Francis turbines (1923) and their generators manufactured by General Electric (1908), and many machines used for electric power transmission.

- 1770-1 Yaotsu, Yaotsu-cho, Kamo-gun, Gifu Prefecture
- Tel: 0574-43-3687
- Hours: 9:00 AM - 4:00 PM (from January to March, 10:00 AM - 4:00 PM)
- Closed: Mondays, New Year's holidays
- Admission: Adults ¥320, elementary and junior high school students ¥110
- Access: From Akechi Station on Meitetsu Hiromi Line, a 35-minute bus ride, get off at Kanden-mae.
- URL: <http://www.kepco.co.jp/info/tokai/home.htm>

MIE Prefecture

38 Hakari no Yakata (Scales Museum)

The curator of this museum almost single-handedly collected the 4000 scales and 3000 related items displayed here after he became interested in a silver scale from the Edo Era with a 31-centimeter handle and Jin family crest of the national standard scale on the plate and the weight. Another scale here is 3 meters long, designed to weigh cannon balls during the Bakumatsu Period. A 1940 scale manufactured by Tsushima and Kawasaki Companies is kept in a glass case, and is capable of measuring from 0.5 g to 50 kg.

- 1163 Nakano-cho, Yokkaichi City, Mie Prefecture
- Tel: 0593-39-0936
- Hours: 9:30 AM - 5:00 PM
- Closed: Mondays, December 28th - January 5th
- Admission: High school students and above ¥100, junior high school students and younger free.
- Access: From Hobo Station on Sangi Railways, a 15-minute walk to the west.

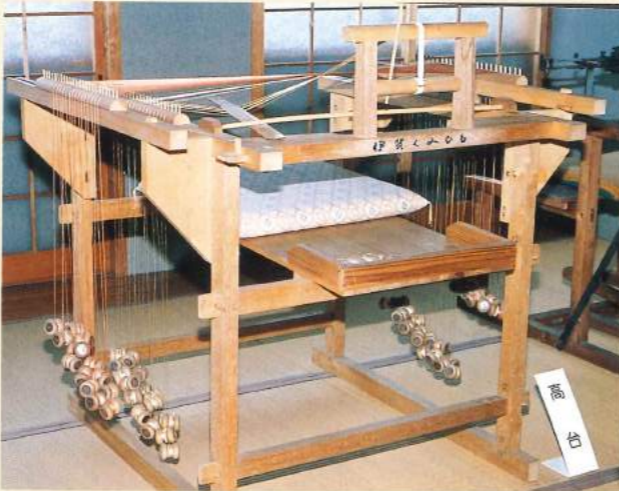


Silver scale with the Jin family's stamp on the plate and weight, Hakari no Yakata

39 Iga Braid Center

Japanese braid, or Kumihimo, well-known as the cords to fasten Obi and other parts of the kimono, is often seen recently in various types of Western clothing and accessories as well. This center's second floor houses various types of braiding equipment: the tall, the round, the lease-rod, the square, and the manual types. The history of Kumihimo from its early beginnings to its present status as a Designated National Traditional Handicraft is presented, along with workshops for the visitors.

- 1929-10 Shijukumachi, Ueno City, Mie Prefecture
- Tel: 0590-23-8038 ● FAX: 0595-24-1015
- Hours: 9:00 AM - 5:00 PM
- Closed: Mondays (unless Monday is a holiday), New Year's holidays
- Admission: free
- Access: From Ueda Station on Kintetsu Iga Line, take Mie Bus for Shimin Byoin, get off at Namimatsu, a 3-minute walk to the east.
- URL: <http://www.kumihimo.or.jp/>



The tall type of braiding equipment, Iga Braid Center

SHIZUOKA Prefecture

44 Fuji Municipal Museum

This museum teaches us about the "Capital of Paper", as Fuji City is known to be called, from the early days in the Jomon Era to the present. The Paper Display Room carries resources about the beginning days of the Iiyamase Factory of the Fuji Paper Manufacturing Company. There is a replica of a "round meshed paper-maker", as well as the dryer portion of a paper machine and a digester.

- 66-2 Denpo, Fuji City, Shizuoka Prefecture
- Tel: 0545-21-3380 ● FAX: 0545-21-3398
- Hours: 9:00 AM - 5:00 PM (9:00 AM - 4:30 PM from November to March)
- Closed: Mondays, the day after a holiday, New Year's holidays
- Admission: Adults ¥100, children ¥50
- Access: From Fuji Station on JR Tokaido Honsen, take bus to Hakubutsukan Iriguchi.
- URL: <http://www.city.fuji.shizuoka.jp/>

45 Hamamatsu Municipal Museum

This museum allows for a realistic understanding of the history and culture of Hamamatsu. In the Recent History Room, there are displays of the hand loom, wooden foot-pedaled loom, wooden power loom, and semi-wooden power loom in the order of their historical appearance. Enshu cotton, which became popular in the middle part of the Meiji Era, was woven by the foot-pedaled loom and the half-wooden, half-steel loom. Hand-spinning tools and a Garabo spinning machine are also displayed.

- 4-22-1 Shijimizuka, Hamamatsu City, Shizuoka Prefecture
- Tel: 053-456-2208
- Hours: 9:30 AM - 5:00 PM
- Closed: Mondays, the day after a holiday, December 29th - January 3rd
- Admission: Adults ¥300, high school students ¥150, elementary and junior high school students ¥100
- Access: From JR Hamamatsu Station, take Entetsu Bus bound for Shijimizuka/Sanarudai, get off at Hakubutsukan, a 1-minute walk to the west.
- URL: <http://www.city.hamamatsu.shizuoka.jp/hamahaku/>



The foot-pedaled loom, Hamamatsu Municipal Museum

46 Oigawa Railways Steam Locomotive Museum

Located within the Senzu Station premises, this museum displays many items of interest relating to steam locomotives. Boiler tubes, old tools, wheels from the C56 steam locomotive brought back from Thailand, and rack wheels from a sister railway in Switzerland are but a few examples; they are significant because they have all seen good use. Photographs tell the history of the Oigawa Railways here, and there is a model layout that can be operated by visitors using a real controller.

- 1216 Senzu Uenoshima, Motokawane-cho, Sohara-gun, Shizuoka Prefecture
- Tel: 0547-59-2065
- Hours: 9:00 AM - 4:00 PM
- Open year-round
- Admission: ¥100
- Access: Senzu Station, Oigawa Railways
- URL: <http://workshop.pplus.co.jp/sl/#anchor1201353>

40 Komono-cho Local History Archives

Started in 1978, this museum houses a vast amount of local historical material, including the Iwandani water wheel. On the first floor is a gasoline-engine pump truck on wheels with a wheel base of 1.55 meters, tread of 0.85 meters, and height of 1.3 meters, which was used locally for half a century from 1928. Various types of fire-extinguishing equipment including hoses and buckets are displayed, giving visitors a first-hand understanding of the history of fire prevention in Komono-cho.

- 1097-3 Ooaza Komono, Komono-cho, Mie-gun, Mie Prefecture
- Tel: 0593-94-2200 ● Hours: 10:00 AM - 4:00 PM
- Closed: Sundays, Tuesdays, Thursdays, Saturdays
- Admission: free
- Access: From Komono Station on Kintetsu Yunoyama Line, a 5-minute walk to the northwest.

41 Matsusaka Municipal Folk History Archives

A 1911 library building was transformed into this museum in 1978, and is now a Designated Cultural Asset. The local specialties and enterprises are well depicted here: from Sewa Village, mercury was tapped and used in "Ise Facial Powder"; from Matsusaka, high-quality cotton fabric was produced and was a hit nationwide. A rare loom to weave the cotton fabric is displayed, and so is a 1922 Francis runner that sent power to a railway between here and Ooishi.

- 1539 Tono-cho, Matsusaka City, Mie Prefecture
- Tel: 0598-23-2381
- Hours: 9:00 AM - 4:30 PM (9:00 AM - 4:00 PM from October to March)
- Closed: Mondays, the day after a holiday, New Year's holidays
- Admission: Adults ¥100, elementary and junior high school students ¥50
- Access: From Matsusaka Station on JR Kansai Honsen or Kintetsu Nagoya Line, a 15-minute walk to the west.
- URL: <http://www.city.matsusaka.mie.jp/index.html>

42 Sea-Folk Museum

This museum depicts the lifestyles of the people in the fishing villages of Mie through its displays of boats, fishing equipment, and tools from the villagers' daily lives. Thirteen of the 60 boats on display here have been designated as Important Cultural Assets; they employ natural ventilation and "Tataki" floors in their storage rooms. Over 3000 fishing nets, 2000 boat carpentry tools and wooden blueprints, and numerous records of the fishmongers' lifestyles, outlooks, and religious beliefs are shown.

- 1731-68 Ogitsu, Uramura-cho, Toba City, Mie Prefecture
- Tel: 0599-32-6006
- Hours: 8:30 AM - 5:00 PM (July 20th - August 25th, 8:30 AM - 5:30 PM; November 11th - March 20th, 9:00 AM - 4:30 PM)
- Closed: June 26th - June 30th, December 26th - January 1st
- Admission: Adults ¥800, elementary through high school students, ¥400
- Access: From Toba Station on JR Sanguu Line and on Kintetsu Toba Line, a 20-minute ride on Mie Kotsu Bus, get off at Uminohakubutsukan-mae, a 10-minute walk to the west

43 The Kiwa-cho Mining Museum

The Kishu Mine has a long history, having been producing copper ore since the Nara Era. A diorama takes us through the mining processes over the years in this museum, and then we ride the elevator that shoots us down a mine shaft. The first floor shows laborers operating boring machines, a locomotive pulling an ore cart, and a rock breaker tapping for ore. Remains of the Kishu Mine, such as the mine entrance, can be seen nearby.

- 110-1 Sakaya, Kiwa-cho, Minimimuro-gun, Mie Prefecture
- Tel: 05979-7-1000 ● FAX: 05979-7-1001
- Hours: 9:00 AM - 5:00 PM
- Closed: Mondays (Tuesday if Monday is a holiday), December 30th - January 1st
- Admission: Adults ¥500, elementary and junior high school students ¥200
- Access: From Shingu Station on JR Kishu Honsen Line, take Sanko Bus for 1 hour 10 minutes, get off at Matsuya, a 1-minute walk to the east.
- URL: http://www.nhk-chubu.brains.co.jp/mie/kiwa/mine_index.html

SHIZUOKA Prefecture

47 Sakuma Rail Park

This museum opened on the train depot grounds of Chubu Tenryu Station on the JR Iida Line in 1991. The only railroad museum run by JR, it displays 16 trains, including the ED11 electric locomotive made by GE and imported from the US in 1923. Unusual railroad parts, models, photographs and other resources are abundant in the museum; there are simulations and dioramas for children to enjoy also. Visitors can ride a train pulled by the electric locomotive to come here during the peak season.

- 15-3 Hanba, Sakuma-cho, Iwata-gun, Shizuoka Prefecture
- Tel: 0539-65-0003 (Chubu Tenryu Station), 0265-22-7082 (JR Tokai Iida Branch)
- Hours: 10:00 AM - 4:00 PM
- Closed: Weekdays, New Year's holidays (open only on Saturdays, Sundays and holidays; open daily during spring and summer vacations)
- Admission: Adults ¥140, children ¥70 (platform tickets to enter station); any ticket to Chubu Tenryu Station allows entrance also.
- Access: Chubu Tenryu Station on JR Tokai Iida Line
- URL: <http://www.jrtokai.net/index.html>

48 Shimizu Bay Museum (Verkehr Museum)

The items on display in this museum are mostly related to Shimizu Port, such as hooks for piling crates, saws used for the production of wooden barges, diving suits used by workers during riparian works and hand pumps to supply air to these suits, can-making machines, and other first-hand resources that tell the history of the port. There is an open-air display located 1.5 km to the west, with trains that ran on the now defunct Port Line, and the yacht that crossed the Atlantic Ocean from here to San Francisco.

- 2-8-11 Minatomachi, Shimizu City, Shizuoka Prefecture
- Tel: 0543-52-8060
- Hours: 9:30 AM - 4:30 PM
- Closed: Mondays (open if Monday is a holiday)
- Admission: Adults ¥400, high school and junior high school students ¥300, elementary school students ¥200
- Access: From Shimizu Station on the JR Line or from Shin Shimizu Station on Shizuoka Railways, take Shizutetsu Bus to Hatoba Verkehr Hakubutsukan Mae. (For open-air exhibit, take Shizutetsu Bus to Miyakami.)
- URL: <http://www.suzuyo.co.jp/suzuyo/verkehr/>



Diving suit and hand pump for diving suit, Shimizu Port Museum

49 Takayanagi Memorial Museum

Kenjiro Takayanagi devised the world's first electronic television technique in 1926 here, on what is now Shizuoka University's Technology Department campus, and on which this museum was built in 1961 to commemorate his work. Although many of his works were lost during the war, those that remain in this museum include the materials for the Nipkow disc, early cathode-ray tubes and iconoscopes, and image orthicons, items that illustrate Takayanagi's dedication and perseverance.

- Technology Department, Shizuoka University, 3-5-1 Johoku, Hamamatsu City, Shizuoka Prefecture
- Tel: 053-472-7561
- Hours: 10:00 AM - noon
- Closed: Saturdays, Sundays, New Year's holidays
- Admission: free
- Access: From Hamamatsu Station on JR Tokai Honsen, take bus to Kogakubu Mae
- Reservations required; tours can be arranged beforehand.
- URL: <http://tells.eng.shizuoka.ac.jp/tecfes/tecfes99409.htm>

50 The Ikawa Collection

Situated on the cliff overlooking Chubu Electricity's Ikawa Dam, the museum itself is a remodeling of the elevated bridge on which cranes were operated during construction of the dam. The museum houses historical photographs relating to hydroelectric tapping of the Ooi River, and items such as penstocks used in the Ooigawa Power Plant. Tours are conducted to view the interior of the dam and the power plant. There is a mini-train on the Ikawa Line for visitors to take for this purpose.

- 1956-1 Ikawa, Shizuoka City, Shizuoka Prefecture
- Tel: 054-260-2307
- Hours: 9:00 AM - 4:00 PM
- Closed: Fridays, New Year's holidays
- Admission: free
- Access: From Ikawa Station on Ooigawa Railways, a 5-minute walk.
- For details on tours, contact the Ikawa Collection directly.
- URL: <http://www.chuden.co.jp/kozin/pr/pr.html>

51 Yamaha Engine Communication Plaza

This museum lies within the Head Office of Yamaha Engines in Iwata City, Shizuoka. A wide range of vehicles is displayed, such as motorcycles, boats, and radio-controlled helicopters. Yamaha's first motorcycle, the YA-1, and Japan's first sports car (which was made in collaboration with Toyota), the Toyota 2000GT, are two of the vehicles that are displayed here which can be said to be representative of each age. The history and technology of Yamaha are clearly illustrated in this museum.

- 2500 Shinkai, Iwata City, Shizuoka Prefecture
- Tel: 0538-33-2520 ● FAX: 0538-33-2530
- Hours: 10:00 AM - 4:00 PM (last entrance 4:30)
- Open to public on second and fourth Saturdays.
- Admission: free
- Access: From Iwata Station on JR Tokaido Honsen, take bus for 15 minutes, get off at Yamaha Mae.
- URL: <http://www.yamaha-motor.co.jp/cp/>



The YA-1 and Toyota 2000 GT in the Yamaha Engine Communication Plaza

NAGANO Prefecture

52 Forest Railways Museum

The Ogawa Forest Railways was the first railroad to be designed to run through a forest. The last stop on the line, Akazawa Station, is the site of this museum. Starting with the Baldwin steam locomotive (1915), the trains displayed here were all used by the Forest Railways: diesel locomotives, motor cars, passenger cars, barber cars, and freight cars. Since 1987, efforts are being made to revive the Forest Railways from Akazawa through the natural cypress forest composed of trees that are 300 years old.

- Ogawa Iri Kokuyurin, Agematsu-cho, Nagano Prefecture
- Tel: 0264-52-2083 (Kiso Forest Maintenance Department of Chubu Forest Maintenance Division)
- Hours: 8:30 AM - 4:00 PM
- Closed: November 4th - April 28th
- Admission: free
- Access: From Agematsu Station on the JR Chuo Line, a 40-minute bus ride on the Ontake Kotsu Bus, get off at Akazawa. (Bus runs on Saturdays, Sundays, and holidays only.)
- URL: <http://www.town.agematsu.nagano.jp/>



Baldwin steam locomotive in the Forest Railways Museum

53 Horigane Village History and Folklore Museum

Opened in 1979, this collection is an extension of an elementary school social studies project in which materials relating to the local way of life and history were gathered; these research materials have now reached 6000 items, the major part of which are local folk goods and agricultural, cocoon-industry, and forestry equipment. As this is the birthplace of Tacchi Gaun, the father of the Garabo spinning machine, there are also displayed here several spinning, twining, and threshing machines in his honor.

- 2753-1 Karasugawa, Horigane-mura, Minami Azumi-gun, Nagano Prefecture
- Tel: 0263-72-5796
- Hours: 9:00 AM - 4:00 PM
- Closed: Mondays, the day after a holiday, New Year's holidays
- Admission: Adults ¥100, high school students and younger ¥50
- Access: From Toyoshina Station on JR Oito Line, a 30-minute walk to the west.

54 Okaya Municipal Cocoon Museum

Okaya City was well-known worldwide for its booming silk thread exporting business from the Meiji Era up to the Second World War. This museum, which began operations in 1964 through the efforts of the local cocoon association, tells the socioeconomic and technological history behind Okaya's silk production. Inside, there is an 1872 French-type thread reeler which was used by the Tomioka plant from the very start, as well as a moisture-content-measuring device for raw silk thread, imported from France.

- 4-1-39 Honmachi, Okaya City, Nagano Prefecture
- Tel: 0266-22-5854
- Hours: 9:00 AM - 4:30 PM
- Closed: Mondays, holidays, New Year's holidays
- Admission: ¥350
- Access: From Okaya Station on JR Chuo Honsen, a 15-minute walk to the northwest.

55 Ookuwa Village History and Folklore Museum

This museum is situated along the bank of the Kiso River, and is built out of endogenous cypress and uses the local shack-type of architecture. Inside, there are the forestry corner, hydroelectric power corner, an introduction of Suharajuku as one of the stopping points for the Nakasendo Pilgrimage, and a corner depicting the cocoon industry of this area from the Meiji to the early Showa Eras. Each tool in each corner was a means of livelihood for the people of the Kiso region.

- 1-58 Tono, Ookuwa Village, Kiso-gun, Nagano Prefecture
- Tel: 0264-55-3550
- Hours: 9:00 AM - 4:30 PM
- Closed: Mondays, wintertime (depending on the year)
- Admission: Adults ¥200, children ¥100
- Access: From Suhara Station on JR Tokai Chuo Line, a 15-minute walk to the west.
- Reservations should be made with the Ookuwa Village Educational Board, 0264-55-1020

56 Oomachi Energy Museum

Built in 1982 as a place to deepen understanding of the harmony between energy, nature, and environment, this museum looks at various types of energy such as solar energy, but hydroelectricity is heaviest in emphasis. The Pelton, Francis, and Kaplan runners are displayed for your comparison. Outdoors, there are Francis turbines and AC generators as they were used in different parts of the country, a rotary converter, and concrete buckets used during the Kurobe Dam construction.

- Oaza Hiratakeiri, Oomachi City, Nagano Prefecture
- Tel: 0261-22-7770 ● FAX: 0261-22-7700
- Hours: 9:00 AM - 5:00 PM
- Closed: December 1st to end of February
- Admission: High school students and older ¥400, junior high school students ¥300, elementary school students ¥200
- Access: From Shinno Oomachi Station on JR Oito Line, 15 minutes by taxi.
- URL: <http://www.renkei.or.jp/ichiran/kanshin/omachi.html>



Aluminum electrolysis tank in the Oomachi Energy Museum

57 The Kansai Electric Power Co. Kisogawa Electric Power Museum

This museum, established on the site of the Suhara Power Plant, displays items relating to power generation from the Kiso River, the beginnings of which were the construction of the Yaotsu power plant in 1906. On the first floor are displayed turbines, generators, a governor, a transformer and maintenance tools; on the second floor, there are documents, photographs, and other historical materials. On a hill behind the museum is the "Momosuke Garden" which commemorates the achievements of Momosuke Fukuzawa, Japan's "King of Electric Power."

- Tono, Ookuwa Village, Kiso-gun, Nagano Prefecture
- Tel: 0264-52-4681
- Hours: 9:00 AM - 4:00 PM
- Closed: Saturdays, Sundays, holidays, New Year's holidays
- Admission: free
- Access: From Suhara Station on the JR Chuo Line, a 15-minute walk to the west. Reservations are needed.
- URL: <http://www.kepco.co.jp/info/tokai/home.htm>

The Chubu Society for the Industrial Heritage

Objective: To study, research and preserve the monuments of industrial heritage.

To strive for the widespread research and development of fields related to industrial heritage.

History: Its origins are in the Aichi Research Society for Engineering Education (Aichi Gikyo-Ken), which was founded in the 1970's for the purpose of incorporating the history of engineering into engineering education. In 1984, the Society for the Research and Preservation of Industrial Relics and Remains of Aichi (Aichi San-I-Ken) was founded with Aichi Gikyo-Ken as its parent organization.

Aichi San-I-Ken, with the aid of research funding from the Toyota Organization, did extensive research over a period of three years on the industrial heritage of Aichi Prefecture. The results of this survey were compiled into the "Research Report on the Industrial Remains and Relics of Aichi."

The organization expanded its activity territory to include the entire Chubu region, and founded the Chubu Society for the Industrial Heritage (abbreviated as Chubu San-I-Ken) with Aichi San-I-Ken as its parent organization, and maintains this structure to the present day.

Number of members and structure: Composed of 120 private members and 4 corporation members as of March, 2000. These members include salaried workers, university students, arts personnel of museums, high school teachers, and older people who are enjoying their retired lives. Membership is based solely on motivation; anyone who has an interest in the industrial heritage can become a member.

Major activities:

(1) Bi-monthly meetings

In these meetings, members bring in their information regarding the industrial heritage in various forms, such as research reports on industrial heritage, studies on industrial and engineering history, and lists of reference materials.

(2) Yearly journal

"Studies on the Industrial Heritage," published annually.

(3) Research and investigative tours

Research expeditions and investigative tours are conducted whenever the occasion arises, to Chubu's monuments of industrial heritage and pertinent museums.

(4) Symposiums

In addition to the bi-monthly meetings, two symposiums are conducted annually, one entitled "The Eyes to the Engineering History of Japan," and the other, "The Course of Chubu's Electricity." These provide an opportunity for the members to publicly exhibit the results of their research.

(5) Preservation movements for the monuments of industrial heritage

It is often more difficult to preserve the monuments of industrial heritage than it is other forms of cultural resources; however, the Chubu Society for the Industrial Heritage has proven that with enough effort, these monuments can be preserved. Among the examples of monuments which have been preserved with the Society's movements acting as a trigger, are the following: the sluiceway Shonaiyosui-Motoirih (Nagoya City); the waterwheel runner of the Furi Hydroelectric Power Station (Horai Town, Aichi Prefecture); Garabo spinning machines (as seen in the Ichinomiya Municipal Museum, Industrial Engineering Memorial Hall, etc.); the dupion-cocoon silk thread processing machine (Toyohashi City); the Oodakara pump (Tobishima, Aichi Prefecture); the industrial heritage of Aichi Spinning Mill (Okazaki City); the giant deceleration cogwheel on the rolling machine for steel flattening, produced by Yahata Steel Manufacturing Company (Nagoya City); the old Tsuge Bridge (Horai Town, Aichi Prefecture); and the old Kabuto Beer factory's red brick building (Handa City).

INTRODUCING THE BOOK "REDISCOVERING THE ART OF MANUFACTURING: A JOURNEY THROUGH THE INDUSTRIAL HERITAGE OF THE CHUBU REGION" (Japanese)

The Chubu Society for the Industrial Heritage

This book introduces the resources on industrial heritage in the Chubu region of Japan. In the 310 pages within, you will find 146 color and black-and-white photographs, 10 diagrams, 134 access maps, 57 guides to museums, and 15 chapters describing some of our valuable industrial heritage legacies.

The reason why we possess so many industrial heritage legacies is that this region has been the center of manufacturing.

The Chubu prefectures of Aichi, Gifu, Mie, Shizuoka and Nagano pride themselves in being the number-one producers nationwide in many areas of manufacturing. The technologies for which we pride ourselves were not created overnight. In an effort to learn from the footsteps of our forefathers about the power that fueled the rise in our technological standards, the Chubu Society for the Industrial Heritage, which is comprised of scholars and fans of local history, has done research over a long period of time on industrial heritage in many areas. Their results are collected in the pages herein. This book will teach you the importance and joy of manufacturing through its valuable photographs and well-documented records.



Price: 3,500yen (tax not inclu.)
ISBN No.: 4-900041-81-5

Ordering:
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Rediscovering the Art of Manufacturing

A Journey through the Industrial Heritage of the Chubu Region

English Guidebook Version

Price: 1,000yen
(plus tax and postage)

This book is an abridged version of the Japanese book "Rediscovering the Art of Manufacturing: A Journey through the Industrial Heritage of the Chubu Region" and has been redesigned into the form of an English guidebook.

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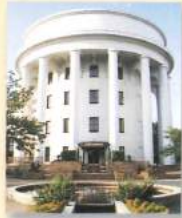
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