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EARLY HISTORY AND DEVELOPMENT  
OF THE RAILWAYS OF JAPAN

James A. Kokoris

Master's Thesis

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EARLY HISTORY AND DEVELOPMENT  
OF THE RAILWAYS OF JAPAN

by

James A. Kokoris

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EARLY HISTORY AND DEVELOPMENT  
OF THE RAILWAYS OF JAPAN

by

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I. INTRODUCTION

The year 1868, which marks the overthrow of the Tokugawa Shōgunate, is usually taken as a point of departure in studying modern Japan. It was at this time that Emperor Meiji (enlightened government) was restored to power taking the name Meiji (enlightened government) to designate the new era. The imperial capital was moved east from Kyōto to Yedo, the city from which Tokugawa rulers governed the country, and was renamed Tōkyō, or "Eastern Capital". The new government set out to strengthen itself through various reforms and adoptions of Western ideas and methods.

The swiftness with which Japan made the change from a secluded state to one bent on assimilating Western culture often gives the impression of a clearly defined change of policy brought about mainly by the "opening of the doors of Japan" by Admiral Perry. However, although the shōgunate still seemed impregnable at the time of Perry's first arrival in 1853, the foundations of its rule had been undermined by changes in the political and social structure as well as by changes in the stress on certain ideational values regarding the Emperor - changes brought about by the philosophical movement for the revival of Shintō.

Actually, the relative ease with which Japan broke away from the old social structure, as constituted under the Tokugawas, was due to social and economic strain and unrest amongst certain groups and clans in the latter years of Tokugawa rule. The entrance of Western countries upon the Japanese scene in the middle nineteenth century served as a catalyst in the pro-

cess of adjustment to the internal strains and hastened the downfall of the Tokugawas. The Shōgun, forced to welcome the foreigners and to conclude agreements with them, placed himself before the dissatisfied clans as a usurper of imperial rights and betrayer of his country. The Tokugawa regime suffered discredit both for the economic and political evils growing out of feudalism and for the actions it undertook in adjustment to these evils.

The bold and vigorous leadership which was demanded by the events and trends of the times was to come from sources other than from the Shogunate. Much of this leadership was found in the four clans of Satsuma, Chōshū, Hizen, and Tosa<sup>1</sup>. It was the samurai of lower rank from these tozama daimiates who initiated the revolt and played an important role in the moulding of a new Japan.

The industrial development of Japan along Western lines was adopted early as a policy by the statesmen of Japan who did not waste any time in sowing the seeds which were to remake Japan from a country with a feudal - agrarian economy into one of a capitalistic - industrial economy and one of the leading world powers.

The problems confronting any country emerging from feudalism into industrialization are to create a national market, to break down barriers by creating a transportation system and

<sup>1</sup> Prince Itō Hirobumi and Viscount Inouye Masaru of the Chōshū clan and Count Ōkuma Shigenobu of the Hizen clan were leaders in the movement for industrialization and especially in the development of railways. Inouye was Director General of the Japanese Government Railway Bureau from its formation in August, 1871 until he resigned in March 31, 1893.



to create a fluidity of goods, capital and labor. In copying and adopting ideas in the field of industrialization from Western countries, Japan was looking to nations which had come a long way in the process of industrial development, hence was at an advantage in that she could skip the early evolutionary stages of capitalistic production. Instead of beginning with the production of consumer goods and light industry, Japan was able to start with undertakings of key, heavy industries such as iron-works, ship-building and construction of railroads. The government built and financed many of these heavy industries and aided private companies through subsidies and guarantees of profits. This study will concern itself with one of these key industries, the railroads, which in a highly industrialized nation can be likened to the arteries in the human body carrying the life-blood which feeds and nourishes the industries of the nation. A thorough and comprehensive study of all phases of the railroads of Japan is beyond the scope of this paper. Communication and travel in pre-Meiji times will be dealt with as a background to the development of railways. The early history and development of the state and private railways, the nationalization of the private railways in 1906, and subsequent railway development as well as some social and economic effects of the introduction of railroads will be considered. The administration and finance of railways, studies of rolling stock, manufacture of railway equipment, and studies of great engineering feats in bridge and tunnel construction and other phases of Japanese railways, which can be complete studies within themselves, will not be dealt with.

## II. COMMUNICATION AND TRAVEL IN PRE-MEIJI TIMES.

Land routes and passages in Japan were usually prescribed by nature through her variations in the topography of a region. Natural routes were few and the great roads were determined by geography. This was especially true in times preceding the age of mechanization when roads had to follow the contours offering the least resistance. The shortening of routes which resulted from modern tunneling and bridging practices could not even have been imagined as possible in pre-industrial eras. Notwithstanding the modern advances in engineering and the altering of routes taken by the railroads it will be found that the main trunk lines of Japan follow quite closely the old roads.

Most of the old roads were associated with the region through which they passed. In 646 A.D., by the Taika, or Great Reform Edict, the eight geographic regions recognized at that time were divided into provinces and through each region a road was built<sup>1</sup>. Many of the reforms of the Taika Edict were modelled after existing Chinese institutions of the then contemporary T'ang Dynasty. For example, ideas for political organization (central bureaucratic system) and construction of cities as well as post roads, were adopted from China. The regions delimited by the reforms were: (1) The Go-Kinai area or "Five Home Provinces" centered around the modern Kansai region of Kyōto, Ōsaka and Kōbe; (2) The Tōkaidō or "East Sea Route"; (3) The Tōsandō or "Eastern Mountain Route" also known as the Nakasendō or "Central Mountain Route"; (4) The Hokurikudō or "North Land Route";

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<sup>1</sup> Robert B. Hall, "Tōkaidō-Road and Region." Geographical Review, XXVII (1937), p. 357.

(5) Sanindō or "Mountain Shade Route"; (6) Sanyōdō or "Sunny Side of the Mountain Route"; (7) Saikaidō or "West Sea Route" known also as the Kagoshima Kaidō, the road which became the trunk line of the Kyūshū Railroad; and (8) The Nankaidō or "Southern Sea Route" which included the island of Shikoku<sup>1</sup>. Many of these roads have become the main arteries of Japan's modern railway.

In the days of the Yamato and Nara periods in the sixth, seventh and eighth centuries, Buddhist priests often had a hand in the promotion of transportation and communication facilities. They often chose solitary and mountainous parts of the country for the erection of temples. In the history of Japan many of the priests were noted as discoverers and engineers. The building of bridges and embankments, and road construction through difficult terrain was often accomplished by priests. Many temples built in the mountains at that period still remain.

During the Tokugawa Era the political and commercial center was moved from Kyōto to Yedo. Emanating from the Tokugawa capitol were five main highways known as the Go-Kaidō and all started from Nihon-bashi or "Bridge of Japan". They were the (1) Tōkaidō, (2) Nakasendō, (3) Nikkō, (4) Ōshū (Northeastern District) and (5) Kōshū or Kai Province routes<sup>2</sup>. All these roads

<sup>1</sup> Ibid., p. 356. A more detailed account of the old roads and regions of Japan, with particular emphasis on the colorful history of the Tōkaidō, is to be found in the above reference.

<sup>2</sup> Neil Skene Smith, Tokugawa Japan (London, 1937), p.51. See appendix for the route of the Nakasendō and Kōshū Kaidō.

and their branches served, during the reign of the Tokugawas, almost exclusively for military and administrative purposes. These five main roads which had been designated by the Shōgun were each under the supervision of Dōchū Bugyō or Road Magistrates<sup>1</sup>. Nihonbashi had become the focal point of the roads and distances were measured from this bridge in Tōkyō just as they were measured from Kyōto in the days when it was the political center of Japan. Many provinces had received their name from their relative positions away from Kyōto. For example, the suffixes zen, chū and go were added to regional names to denote a particular area from the point of view of one traveling from Kyōto. A "center" region (chū) was taken as a reference point in naming the provinces "before" (zen) and "beyond" (go) the province of reference. North and east of Kyōto were to be found the provinces of Echizen, Etchū and Echigo; west of Kyōto were Bizen, Bitchū and Bingo, and in northern Kyūshū were such Kuni names as Hizen and Higo.

The development of travel in the West since the Medieval period has followed improvements in roads and in means of transport and communication. In Japan during the era of seclusion transport systems and institutions developed which were peculiar to the social and political structure under the Tokugawas and to the topographic nature of the land. These factors held travel in Japan in a state of considerable inconvenience.<sup>2</sup>

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<sup>1</sup> Takaharu Mitsui, "Travel in the Tokugawa Era" Cultural Nippon, Vol. VII, No. 3, p. 70.

<sup>2</sup> Eijiro Honjo, Nippon Kotsushi no Kenkyu 日本交通史の研究 (Studies in the History of Japanese Transportation), Tokyo, 1929, pp. 1-27, covering transportation in the Tokugawa period.

During the Tokugawa Era as well as in preceeding periods, the modes of travel were restricted to foot, horse and palanquins. Such means of transportation as the hako-kago or enclosed palanquin and yama-kago or hard, open palanquin, common throughout the Orient, were utilized by court nobility, daimyō, distinguished ladies, rich merchants and high officials when they undertook a long journey<sup>1</sup>. Samurai and lesser officials usually traveled by horse or foot. The great majority of travelers, however, had to walk. For the dispatch of official messages and mail, relays of runners were used over the main roads. There was nothing in Japan resembling the Pony Express mail service in the United States nor was there an express horse service for travelers on urgent business. Under such primitive conditions, the fastest method available for travel was palanquins, which were carried at full speed by coolies.

Contrary to countries of the West in the same period, the use of vehicles failed, for some reason, to develop as a means of highway communication in Japan. Wheeled vehicles were mainly used for hauling agricultural produce in the low lands as for example in bringing rice to the markets at Ōtsu. A point of conjecture in considering modes of transportation is the question of why such a means of travel as the stage-coach which developed in Europe did not arise in Japan. It may be that in Japan, with its few and small plains areas, such a means of travel was impractical as contrasted with the greater stretches of level land in the areas where stage-coaches did develop. Travel by stage-coach along the Tōkaidō with its many unbridged rivers separated by relatively short distances, would certainly have been impractical.

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<sup>1</sup> Hall, op.cit., p.363.

Another consideration preventing the full functioning of vehicles as a means of transport in those days was the poor condition of the roads and highways due to rains, erosion, flooded rivers and lack of bridges. Among the natural obstructions to convenient travel were the many rivers which had to be crossed either by ferry, wading across if the water level was low enough, or if one's class standing called for it, being carried across in a palanquin. If the current was too swift or if the level of the water had risen beyond a certain point, passage was delayed and the traveler had to remain at a way station at the river bank. Another possible reason for the lack of wheeled vehicles may be found in the scarcity of horses to draw the wagons and coaches. Oxen which would have been too slow for passenger carriages, were used in hauling cargo in two and four wheeled carts for short distances in towns and cities. Between Kyōto and Ōtsu where cargo traffic, particularly of rice, was heavy, it seems a stone path was laid out for these ox-driven cargo carts.

E. G. Holtham, one of the British engineers who spent eight years in Japan, from 1873 to 1881, and surveyed among other lines the Kyōto-Ōtsu line, says, "We had heard of a certain stone tramway that had been laid down, say two hundred years before, on the road between Kiyoto and Otsu, as a great engineering work;..... There were two rows of granite blocks, with a deep groove in each row, worn into the stone by innumerable wheels of carts drawn by untold generations of oxen".<sup>1</sup> It is presumed that the carts and

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<sup>1</sup> Edward G. Holtham, Eight Years in Japan 1873-1881 (London, 1883), p. 26.

wagons were for the most part constructed with a standard spacing of the wheels similar to the standardized gauge of cart wheels in China from which the width of roads was determined. Standardization of the gauge of cart wheels in China can be traced to the Ch'in State reforms (221-206 B.C.)<sup>1</sup>

The jinrikisha, which seems to us to be a primitive mode of transportation, was not introduced into Japan until the middle of the nineteenth century. Soon after the restoration, the manufacture of carriages was begun. Thus signs of innovation were present showing the effect of contact with other cultures and indicating the degree to which cultural isolation in the Yedo period had stalled the development of the means of transportation. The fact that vehicles never played an important part in the history of communication and transport in Japan until their introduction in the Meiji Era, is in striking contrast to the West.

The main routes of communication had been opened chiefly for political and commercial reasons, but some of the roads were opened because they led to shrines and temples.<sup>2</sup> In the Yedo period, large commercial cargoes from great distances were carried by water. In the vicinity of Ōsaka, canals, the Yodo River and Lake Biwa were utilized for such transportation. In central Japan, timber produced in the inner mountainous districts was shipped down to sea in floats on the Kiso and Tenryū Rivers.

Probably the most remarkable of the characteristics of communication and trade in the Yedo Period was the absence of

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<sup>1</sup> Political Science 154 Lecture Notes. June 27, 1947, D.N.Rowe.

<sup>2</sup> Aida Jiro, Chusei no Sekisho 中世の障礙 (Barriers in the Middle Ages of Japan). Tokyo, 1943, pp. 9-11.

mass conveyance.<sup>1</sup> Not only was travel inconvenient due to natural difficulties and primitive means of transport but to add to the inconvenience of the traveler, certain restrictions to communication were adopted by the shōgunate as a means of protecting Yedo, the political center, against military attacks from the outside. In accordance with this protective policy, a system of check points or "barriers" was set up along the main roads. Passers-by were examined and the barriers functioned according to the prevailing instruction from Yedo. One of the primary reasons for the check-points system was to prevent any growth in the political strength of the daimyō. The sankin kōtai system which required daimyō to make periodic trips to the capitol and to leave their families there as hostages, was another method of keeping the daimyō from rebelling. Also, construction of bridges across large rivers was limited by the shōgun as a means of checking rebellious armies from making an easy approach. Under these conditions, the movement of large bodies of troops was almost impossible.

To prevent sea transportation of troops, the Tokugawa government strictly limited the tonnage of ships. Another reason for limiting the size of ship was to keep Japanese merchants from sailing to foreign lands and engaging in illegal foreign trade. The largest type of ship authorized by the shōgun was the senkokubune, or a boat with a capacity of one thousand koku. Aside from the small size of the ships, there were difficulties due to poor ship construction, unskillful handling of sails and the length of voyages which tended to restrict sea-travel.<sup>2</sup>

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<sup>1</sup> Mitsui, op.cit., p.78.

<sup>2</sup> Masaru Inouye, "Japanese Communications: Railroads" Fifty years of New Japan. Vol. I (1909), p. 428.



Another deterrent to travel stemmed from the financial difficulties which arose from the existence of different currencies in the various daimiates. Traveling expenses consisted of lodging charges, tips, food and such taxes as tolls at checkpoints and bridges. Money to meet traveling expenses was carried in cash in the form of gold, silver or copper in preference to paper money. Coins were the only legal tender which had general currency throughout the country. Paper notes were issued, with silver as convertible reserve, by each feudal lord as currency exclusively within the limits of his own fief. Towards the end of the Tokugawa Era there arose associations of inns and hotels which greatly relieved travelers from the danger and trouble of carrying a large sum of money in cash.

Through the port of Nagasaki where the Dutch maintained a trading post and through which the Tokugawa Shōgunate maintained contact with the outside world, despite their policy of exclusion, knowledge of the development of locomotives and railways in the West filtered into Japan. The government in the latter days of the Tokugawa regime conceived the evident advantages of constructing railways in Japan. It was in December of 1867 that a Mr. Ogasawara Iki, one of the ministers of the Tokugawa Court, commenced the first negotiations for the introduction of a railway system in Japan. He sought to conduct the plan through American assistance and held several conferences with Mr. Portman, the then Secretary of the American Legation. The negotiations were broken off however with the advent of the Restoration War and the downfall of the Tokugawas.<sup>1</sup>

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<sup>1</sup> Rikitaro Unno, A Resume of Japan's Railway Progress (1907), p. 1.

## III. THE RISE OF THE STATE RAILWAYS

With the coming to power of the Meiji regime, it was very difficult to raise the necessary capital for the new railway enterprise because both the government and the people were very poor. Aside from financial difficulties, there was opposition to the introduction of the railroads by members of the government who had aided in the restoration under the battle-cry "Sonnō Jōi" or "Restore the Emperor and Expel the Barbarian". Other opposition arose from fears of the attendant evils of the railroads and others opposed it on the grounds that it was against the interests of those engaged in old methods of transportation. The people were not in a position to appreciate the benefits to be derived from the railways and generally disliked the railway because of the additional tax burden which would fall on their shoulders. The inn-keepers and goods carriers living along potential railway lines feared it would deprive them of their occupation. In the words of Viscount Inouye Masaru, "Many even of the government officials stood on the side of opposition, some of them crying out, 'To make a foreign loan is to sell the country'. They did not understand what a loan was".<sup>1</sup> It was left therefore to the first railways to prove themselves to the people, which they did. This, together with the imperial celebration of the opening of the first line, caused much of the unfounded old opposition to die away.

Railways were not entirely new to Japan. When Commodore

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<sup>1</sup> Inouye, op.cit., p. 431.

Perry visited Japan and displayed some of the machines and inventions of the West, he also set up a miniature railway along the beach. Thus, was this development of Western industrial civilization first exhibited to the Japanese. As to the railroads having been known to the Tokugawas, Commodore Perry wrote:

Through preserving a certain gentlemanly aplomb, and that self cultivated manner which bespeaks high breeding, these Japanese dignitaries were disposed to be quite social, and shared freely and gaily in conversation. Nor did their knowledge and general information fall short of their elegance of manners and amiability of disposition. They were not only well-bred, but not ill-educated, as they were proficient in the Dutch, Chinese and Japanese languages, and not unacquainted with the general principles of science and the facts of the geography of the world. When a terrestrial globe was placed before them, and their attentions called to the delineation on it of the United States, they immediately placed their fingers on Washington and New York, as if perfectly familiar...with equal promptitude, pointed out England, France, Denmark, and other kingdoms of Europe. Their inquiries in reference to the United States showed them not to be entirely ignorant of the facts connected with the material progress of our country; thus, when they asked if roads were not cut through our mountains they were referring (as was supposed) to tunnels on our railroads. And this supposition was confirmed on our interpreter's asking, as they examined the ships engine, whether it was not a similar machine, although smaller, which was used for traveling on the American roads. They also inquired whether the canal across the isthmus was yet finished, alluding probably to the Panama railroad which was then in progress of construction. They knew, at any rate, that labor was being performed to connect the two oceans, and called it by the name of something they had seen, a canal.<sup>1</sup>

Amongst the presents which Perry brought to the beaches at Uraga were one locomotive and tender, a passenger car and a complete set of rails to form a circle. On the occasion of the delivery, setting up and demonstration of the locomotive, etc.,

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<sup>1</sup> Mathew C. Perry, Narrative of the Expedition of an American Squadron to the China Seas and Japan (Washington, D.C., 1856), p.248.

Perry wrote the following:

The presents having been formally delivered the various American officers and workmen selected for the purpose were diligently engaged daily in unpacking and arranging them for exhibition. The Japanese authorities offered every facility; their laborers constructed sheds for sheltering the articles from the inclemency of the weather; a piece of level ground was assigned for laying down the circular track of the little locomotive, .... the Japanese taking a very ready part in all the labors, and watching the result of arranging and putting together the machinery with an innocent and childlike delight.

Nor did the railway, under the direction of Engineers Gay and Danby, with its Lillipution locomotive, car, and tender, excite less interest (than the telegraph). All the parts of the mechanism were perfect, and the car was a most tasteful specimen of workmanship, but so small that it could hardly carry a child of six years of age. The Japanese, however, were not to be cheated out of a ride, and as they were unable to reduce themselves to the capacity of the inside of the carriage, they betook themselves of the roof. It was a spectacle not a little ludicrous to behold a dignified mandarin whirling around the circular road at the rate of twenty miles an hour, with his loose robes flying in the wind. As he clung with a desperate hold to the edge of the roof, grinning with intense interest, and his huddled up body shook convulsively with a kind of laughing timidity, while the car spun rapidly around the circle, you might have supposed that the movement, somehow or other, was dependent rather upon the enormous exertions of the uneasy mandarin than upon the power of the little puffing locomotive, which was so easily performing its work ....

The Japanese took great delight in again seeing the rapid movement of the Lillipution locomotive; and one of the scribes of the commissioners took his seat upon the car, while the engineer stood upon the tender, feeding the furnace with one hand, and directing the diminutive engine with the other. Crowds of Japanese gathered around, and looked on the repeated circlings of the train with unabated pleasure and surprise, unable to repress a shout of delight at each blast of the steam whistle.<sup>1</sup>

As was mentioned above, Japan was a poor country so that when plans for a railroad began to crystalize, the junior statesmen looked to foreign loans as a means of financing the projected undertakings. The then Mr. Itō, assistant vice minister who later became a Marquis and Prince, and the then Mr. Ōkuma, vice minister of the Home and Finance Departments, were leaders in the early

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<sup>1</sup> Ibid., pp. 357, 358, 372.

railway movement.

It was in consultation with the British representative in Tōkyō, Sir Harry Parkes, that some of the first discussions for the new railways took place. Sir Harry Parkes had pointed out to those who opposed the railways that this new mode of transport could have prevented a famine which occurred in Kyūshū in 1869.<sup>1</sup> The government had to import rice to relieve this famine due to not being able to meet this emergency by introducing rice from the Hokurikuku and Kantō areas where there was an abundant supply for lack of means of long-distance, large-cargo transport facilities. Itō and Ōkuma acknowledged the necessity of a good communications system to prevent the repetition of such famines in the future but they hesitated in making definite plans for lack of funds. It so happened, however, that H. N. Lay, a British financier who had fathered the introduction of the railroad in China, was visiting Tōkyō as a guest of the British Minister. He was on his way home after having resigned the Commissionership of the Chinese Imperial Maritime Customs. He assured the Meiji representatives that he was prepared to furnish the funds necessary to commence railway building in the country.<sup>2</sup> The original plan called for three loans of £ 1,000,000 each, and H. N. Lay was entrusted with carrying out the plans for raising the loans, hiring of engineers and workmen and importing of materials. Lay secured the services of a Mr. E. Morrel, as engineer-in-chief, who came to Japan in March of 1870. Friction arose however between the English capitalist and the Japanese

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<sup>1</sup> George Protheroe, The Railways of the World (New York, 1914), p.621.

<sup>2</sup> Frederick A. Talbot, The Railway Conquest of the World (Philadelphia, 1910), p.304.

Government which did not approve of the financier's methods. The loans had been arranged at a nine percent interest rate and the Japanese had offered as security the railroad lines to be built and the customs receipts of Yokohama harbor.<sup>1</sup> The explanation<sup>2</sup> that the agreement was nullified because the Japanese negotiators were misled into thinking that Horatio Nelson Lay was a relative of the famous admiral, seems hardly plausible. It is more likely that the Japanese feared the danger of foreign control and nullified the agreements pertaining to the remaining £ 2,000,000 loan. Looking to China they could see the effect of the penetration of foreign capital on the economy and it seems the Japanese were determined to keep this outside influence at a minimum. They severed their relations with H. N. Lay and conducted further financial dealings through the Oriental Bank in London. Mr. Morrel was retained however, in his engineering capacity.

Before starting out in the actual construction of the lines, there were several questions to be settled and the preliminary surveys of the permanent ways had to be undertaken. The vital detail of a railway gauge was threshed out in all its bearings. At this time, in England, there were many arguments taking place amongst the engineers regarding the relative advantages and disadvantages of the various gauges.<sup>3</sup>

India was undertaking a program of building lines with a smaller (meter) gauge than the 5'6" gauge then in use. In New

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<sup>1</sup>Philip H. Middleton, Railways of Thirty Nations (New York, 1937), p. 241.

<sup>2</sup>Toshiharu Watarai, Nationalization of Railways in Japan (New York, 1915), p. 27.

<sup>3</sup>Robert F. Fairlie, Railways or No Railways - Battle of the Gauges Renewed - 1872 (London, 1872).

Zealand, the British had decided on a 3'6" gauge. The resemblance of Japan's topography to that of New Zealand encouraged the decision to use the 3'6" gauge in Japan.<sup>1</sup> The Japanese acceded, trusting to the better judgement of the experienced British engineers. They have since come to rue the fact that they did not institute the standard or Stevenson gauge (1435 MM) and have organized several plans for changing the gauge but the tremendous cost and the untold effort that would be involved especially at the present stage of development, looms up as a deterrent to changing the gauge. Even as early in railway development as 1900 it was too late, for huge outlays of capital would have had to be made to make changes in the permanent way and in rolling stock.

At the time of settling the problem of choosing a gauge the advantages and disadvantages were brought out.<sup>2</sup> With a narrow gauge railway, such advantages accrue as allowing for sharper radii curves, reducing the initial cost of construction (narrower bridges and tunnels) and maintaining at less cost as well as taking less time to construct.

Also, in a country with a low percentage of arable land the saving afforded by a narrower gauge is an important consideration. The smaller gauge line can "hug" the contours thus avoiding heavy cuttings, viaducts, tunnels, etc. Some of the disadvantages of the narrow gauge are: a slower train speed due to the smaller driving wheels of the engine and smaller carrying capacity of the freight cars. Also, where all the railroads of the nation do not have the same gauge, the disadvantage of trans-

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<sup>1</sup>See appendix for Table of Railway Gauges in Japan.

<sup>2</sup>C. E. Spooner, Narrow Gauge Railways (London, 1871), pp.71-84.

shipment of passengers and freight arises.

Some of the preliminaries to the exploration and reconnaissance of railway routes had to take into account such factors as agricultural possibility, mineral prospects, topographical features and drainage, amount and nature of industries and the populated areas.<sup>1</sup> When populated areas already exist the object of the railway would be lost unless it passed through these "governing points." Certain alternatives as to the route have their limitations as well as advantages. For example, the valley route is preferred to the ridge route. In the valley route one finds the advantage of long lengths, easy curves and no rock excavations, but all tributaries have to be crossed and expensive bridges must be built. The ridge route is less likely to pass through towns and construction involves digging in rock but no bridges are needed and the grade level is maintained easier for no water is likely to collect in the rail-bed.

The topography of an area plays an important part in railway location.<sup>2</sup> The engineer must make a thorough study of the drainage of an area; passes or the lowest saddle should be utilized; often it is found that a geologic "fault" offers a valuable pass. Hints to be derived from maps often can be helpful. For example, crescent shaped lakes or ponds indicate an old river bed and therefore flat country, while round lakes are apt to be found in hilly country. In tunneling through a mountain the grade should be continued so that there will not be a change in stress on the

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<sup>1</sup> Samuel W. Perrot and F. E. Badger, The Practice of Railway Surveying and Permanent Way Work (London, 1920), pp. 7-18.

<sup>2</sup> Willard Beacon, The Field Practice of Railway Location (New York, 1904).



engine. If the gradient changes in going through a mountain, a gentle vertical curve should be used. All these were fundamental principles which had to be learned by the Japanese.

A characteristic feature of the topography of Japan is the large number of rivers of short length. Generally, they are subject to violent floods in early summer from the melting of snow in the mountains or in autumn from general heavy rain during the typhoon season. The course material carried to the lowlands is deposited by the river when it reaches the alluvial plains and gradually the river bed rises above the surrounding land. Owing to this type of geologic formation of river beds, the railroads in some places are tunneled underneath the rivers instead of bridging them.<sup>1</sup>

Another phenomenon disturbing the topography and hence must be considered in railway building, is the occurrence of earthquakes. The earthquake of 1891 destroyed many railway bridges built by British designers. It is said that the British were accustomed to building bridges in lands (India) where not so violent forces of nature exist.<sup>2</sup> For this reason, special designs were used in new bridge building. Also, due to the mountainous country such special adaptations as the "switchback" were used in places of rapid incline. In mountainous areas, cable cars were also used as well as the Abt system which utilizes a toothed rail between the regular rails and a gear wheel running on it. The steam power is applied to the gear

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<sup>1</sup> Anthropology 293 Lecture Notes. October 6, 1947. "Geography of Japan", R. B. Hall.

<sup>2</sup> Chokurō Kadono, "Japanese Railways", Transactions and Proceedings of the Japan Society, (London, 1902) Vol.V, pp. 39-40.

wheel and thus the motive power is not dependant on the traction of the weight of the engine on the drivers, hence ascent is possible up steep gradients. It is seen from the foregoing that topographical and gauge questions had to be solved before the government could go on to carry out its construction plans.

It was only logical that the government in planning its railroad program should think of connecting the old and new capitols of Kyōtō and Tōkyō. They proposed to do this via the Nakasendō route and then, lines to Ōsaka and Kōbe and branches to Tsuruga on the Sea of Japan from Kyōtō and to Yokohama from the eastern terminal at Tōkyō were to be built.

The actual work was not carried out as originally planned. The first line to be undertaken was the eighteen mile stretch between Tōkyō and Yokohama begun in April of 1870. The engineers, technicians and workmen who built this and other early lines, were mostly Englishmen. The tools, construction equipment, rails, cars, locomotives etc., were all manufactured in England for at that time Japan had no railway equipment industry. A Japanese by the name of Takashima, a business man of Yokohama who was interested in Western engineering methods, contracted with the government to fill in some land along the western shore of Tōkyō Bay between Yokohama and the area north of there. After a year's work with three thousand men he succeeded in 1871 in reclaiming some land which was used by the government for railway purposes.<sup>1</sup> Takashima was considered to be an unprincipled speculator and at times bitterly persecuted by the factions opposing railways but

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<sup>1</sup> Riōtarō Kodama, Railway Transportation in Japan (1898), p.15.

later he came to be honored by the naming after him of a street in Yokohama. On the 7th of May, 1872, work which had begun from both ends of one section of the line was completed and the first train ran from Kanagawa (old name for Yokohama) and Shinagawa. By October 14, 1872, the line was completed from Shimbashi station to Kanagawa, a distance of 18 miles. The line was formally opened by Emperor Meiji himself amidst elaborate festivities and it was supposedly the last time that the Emperor and the court officials appeared in public in full ancient ceremonial attire.<sup>1</sup> Thus it was that the first railroad was built in Japan less than fifty years after the first railway in the United States (1827).

The line between Ōsaka and Kōbe was being built concurrently with the Tōkyō-Yokohama line. Work on this twenty mile section was begun in November, 1870 and completed in May, 1874. The section between Kyōto and Ōsaka (twenty-six miles) was commenced in December 1873 and completed in February 1877<sup>2</sup> making a total length of sixty-four miles of railways. When rail connection was completed between Kyōto, Ōsaka and Kōbe, the Emperor in a formal ceremony, officially opened the lines.

Further progress in railway development was halted for a time due to the serious financial troubles of the government, and its preoccupation with political matters. During the period from 1875 to 1878 only the Kyōto-Ōsaka road was completed, some roads

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<sup>1</sup> Talbot, op.cit., p. 305.

<sup>2</sup> Francis H. Trevithick, "The History and Development of the Railway System in Japan" Transactions of the Asiatic Society (Yokohama, 1894), Vol. 22, p. 117. Trevithick was attached to the Railway Department from 1876-1897 living mostly in Tōkyō.

were double-tracked, wooden-beam bridges were replaced by iron and preliminary studies were made on the Nakasendō route.<sup>1</sup> The financial troubles were in part due to the inheritance of liabilities from the Shōgunate. Also, in its early years, the Meiji government was engaged in suppressing rebellion and in transforming the administrative and economic life of the country. The revenue of the country was drawn almost entirely from the farming class and, burdened with the maintenance of the useless and obsolete class of samurai it could not be made to yield a surplus to be sunk into works which were not immediately productive.

Aside from these financial troubles, the government was preoccupied with problems of social unrest. In 1875 there occurred the insurrection of Saga in Kyūshū which was soon followed by that of Hagi, Chōshū. After the expedition in 1874 to Formosa, there followed political complications with China. Then, after these insurrections and foreign difficulties had been dealt with, the Satsuma Clan in Kyūshū revolted against the Meiji regime. The government was fully occupied in putting down this revolt and in restoring order and efforts to that end called for the expenditure of large sums of money which otherwise could have been devoted to continued economic development.

With the suppression of the Satsuma Rebellion, interest once more returned to the construction of railways. The government recognized in principle the strategic value of a line of communication across the island linking Kyōto with Lake Biwa and the lake with the west coast of Tsuruga - a port which played an important part in the traffic between Vladivostok and Japan.

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<sup>1</sup> Inouye, op.cit., p. 434.

The extension from Kyōto to Ōtsu was commenced in 1879 and completed in 1880. The link between Lake Biwa at Nagahama and Tsuruga was begun in 1880.<sup>1</sup> The inland break in the railways due to Lake Biwa was to be connected by means of ferry steamers. In April, 1882, the government approved the scheme of extending the Tsuruga Line from Nagahama to Sekigahara, upon the completion of which, it further sanctioned in August, 1883, another extension from the latter town to Ōgaki. This section was completed by April, 1884.<sup>2</sup>

The completion of the eleven-mile stretch of the Kyōto-Ōtsu line and the Nagahama-Tsuruga line, marked the decadence of the foreign engineer in railway building in Japan.<sup>3</sup> It had not taken long for the Japanese to recognize the value of railways, and their capacity for adaptation together with their industrious character served them well in grasping the salient features of railway work. They were apt pupils under engineer-in-chief Morrel's training and by the time of the Kyōto-Ōtsu undertaking they considered themselves competent railway engineers. The Kyōto-Ōtsu undertaking, in which native talent found its first opportunity, was a particularly difficult enterprise. The Japanese however rose to the occasion though British engineers were retained to advise them and to design the bridges. On this line tunneling had to be carried out and this was the first occasion

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<sup>1</sup> Holtham, op.cit., p. 101.

<sup>2</sup> Unno, op. cit., p. 3.

<sup>3</sup> Talbot, op.cit., p. 306.

in which the Japanese were faced with this kind of work. They complied with the original plans to perfect satisfaction and had the pleasure of knowing that the cost of construction was less than the original estimates.<sup>1</sup> On the Nagahama-Tsuruga line, the excavation work on the Yanagase Tunnel, 4188 feet, was also engineered by Japanese with foreigners as advisors. In 1877, there were one hundred-twenty British engineers, drivers, foremen, etc., employed by the Japanese but by 1880 only three foreign advisers remained.<sup>2</sup> By the turn of the century the Japanese were capable of building and operating their railways and manufacturing their own engines, passenger cars, rolling stock and steel rails. It should be noted that the cut in foreign personnel came at the time of the Satsuma Rebellion when the government was in serious financial straits, hence the dismissal of these foreigners was not entirely due to replacement by trained natives.

Regarding the gradual change-over to native personnel, a humorous anecdote is related by Holtham, one of the first British railway engineers in Japan, as follows:

The spring of 1879 witnessed another step in advance, in the railway management, by the introduction of native engine drivers to work a portion of the traffic - a long contemplated change, which had been systematically provided for. It is true that between Tokyo and Yokohama the task of engine driving is about as simple as it can be anywhere .... a curious view taken by the non-professional observer as to the dangers of such innovations was well illustrated by a remark attributed to a gentleman .... it would be all very well so long as the train was on a straight line, but he doubted if any Japanese could be trusted to steer the engine 'round those curves'.<sup>3</sup>

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<sup>1</sup> Ibid.

<sup>2</sup> Protheroe, op.cit., p. 622.

<sup>3</sup> Holtham, op.cit., p. 253.

According to the original plan to connect the old and new capitals via the Nakasendō, it was decided in August, 1883, to connect Ōgaki and Takasaki along this route. By the close of that year, bonds were put on the market for the Nakasendō Railway Line. By 1884 work was begun between Ōgaki and Nagoya and between Takasaki and Yokogawa. There were great difficulties involved such as the spanning of the rivers Ibi, Nagara and Kiso at the western end of the Nakasendō, and cutting through the difficult pass at Usui. Other difficulties were met with in transporting materials from the Sea of Japan coast necessary for the construction of the Nakasendō. To facilitate the transportation of these materials, a line was built from Nagoya to Taketoyo (south of Nagoya) in Aichi prefecture and for similar reasons a line was built from the port of Naoetsu to Ueda in Nagano prefecture. The former line, connecting with Ōgaki, was completed in 1886 and the latter was completed in 1887.

In considering further work on the Nakasendō line, it was found that in the central portions there were great topographic obstacles which would require a greater cost of construction per mile than the Tōkaidō route. The greater running time over the Nakasendō route due to reductions in speeds of trains having to climb steep gradients, would increase the working expenses of the railroad. Also, an argument against the Nakasendō route was the absence of larger towns and plains which were however, to be found along the Tōkaidō. Operations on the Nakasendō line were discontinued in 1886 in favor of the Tōkaidō route despite the objections "by military men who insisted upon the advantages

of the Nakasendō from a strategical point of view".<sup>1</sup> Work was begun toward the end of 1886 to connect Yokohama and Nagoya. In February, 1888, work was begun on a line connecting Nagahama with Ōtsu, to eliminate the necessity of a lake ferry connecting these points, and was completed in July, 1889. With the completion of the Yokohama-Nagoya section and the Ōgaki-Maibara (south of Nagahama) - Ōtsu section, the Tōkaidō became a through railway line from Tokyo to Kobe in July, 1889. On the importance of this line, Inouye stated, "...the substantial benefits ultimately derived from altering the Nakasendō route to the Tōkaidō were even greater than was expected at first. Every facility and convenience, for instance, that we enjoyed at the time of the Chino-Japanese War was a result of this alteration".<sup>2</sup>

Other lines built during this period include the Ōfuna-Yokosuka section of ten miles commenced in January, 1888, and finished in July, 1889. The Takasaki-Naoetsu section with the exception of the Usui-Tōge (pass) was commenced in 1884 and completed in December, 1888, a distance of 110 miles. The section through the Usui-Tōge connecting Yokogawa and Karuizawa was begun in March, 1891, and finished by April, 1893. The engineers had deferred building this difficult section of the line in the hopes that an easier location than had been plotted could be found. They failed to find any improved route free of heavy work, so finally they undertook to build through the mountains. The grades were so steep (1 in 40 and 1 in 15) that the Abt type of central rack rail had to be used. The engineers had to drive no

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<sup>1</sup> Inouye, op.cit., p. 441.

<sup>2</sup> Ibid, p. 442.



less than twenty-six tunnels through mountain spurs in a distance of seven miles,<sup>1</sup> while the deep clefts in the mountains called for massive masonry walls and bridges. With the completion of this pass in 1893, through service was provided between Tōkyō and Naoetsu - the section between Tōkyō and Takasaki having been constructed by the private Nippon Railway Company. In traversing the Usui tunnels, the engine was placed behind the train so that the smoke and heat would not enter the passenger coaches. To further insure the comfort of passengers, as soon as the train had entered a tunnel, a curtain was drawn over the tunnel entrance thus keeping some of the smoke from being sucked in. This did not, however, prevent the passenger's discomfort altogether. The passage through the two and a quarter miles of tunnels sometimes left the engineers unconscious from the smoke.<sup>2</sup> It is no wonder that this section was one of the first to be electrified in Japan.

By 1905, the state railways had built about 1500 miles of line and had a total railway investment of \$72,000,000.<sup>3</sup> By this time, private railway lines had taken an active part in railway development with the construction of over 3000 miles of line. In 1906 the state took over the larger private rail lines. Before dealing with the nationalization of the railroads, the rise of the private railway companies will be considered.

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<sup>1</sup> Talbot, op.cit., p. 307.

<sup>2</sup> Protheroe, op.cit., p. 622.

<sup>3</sup> Middleton, op.cit., p. 241.

## IV. (a) THE RISE OF THE PRIVATE RAILWAY COMPANIES

It was in November, 1881, nine years after the completion of the first state railway, when the first charter was issued to a private railway company called the Nippon Tetsudō Kaisha or Japan Railway Company.<sup>1</sup> Indirectly, the origin of the private railway lay in the spirit of the times. The political theories of Herbert Spenser and the economic doctrines of the English school, especially of J. S. Mill, engrossed the attention of most Japanese students and writers. A laissez faire policy was advocated and political liberalism was stressed by politicians and the press. The state railway monopoly was subjected to criticism and accusations of violating business principles in the management of railways. Thus, when application for a charter was made by a private company, the government thought it would be a wise policy to grant such a charter. Aside from the spirit of laissez faire which prevailed, it was generally recognized that the government railway construction program was proceeding very slowly due to financial difficulties; hence, the encouragement of private companies to help in the program for a national railway network. As a means of making efficient use of the non-too-plentiful capital and at the same time extend the railways to new areas, the government did not sanction the construction of competing lines.<sup>2</sup>

The Nippon Railway Company was organized through the instrumentality of Prince Iwakura, a strong advocate of railway

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<sup>1</sup> Trevithick, op.cit., p. 123.

<sup>2</sup> Kadono, op.cit., p. 29.

expansion, mainly for the purpose of assisting peers to secure a profitable investment. Inouye quotes the views of Prince Iwakura as follows: "Should the nobles make a bad use of their capitalized pension bonds granted by the Emperor on the reddition of their estates, they will become bankrupt, but, if these bonds are collected and employed as capital for railway enterprise, there will be advantages on both sides, the company obtaining the necessary funds for its foundation, and the nobles holding the shares of the company as their hereditary property."<sup>1</sup> This company projected the building of no less than 510 miles of railway. The two great contributions to this scheme were the Tōkyō (Ueno) to Takasaki line on which the government guaranteed a profit of eight percent for ten years, and the Ōmiya-Sendai section, guaranteed similarly for fifteen years. Due to the scarcity of engineers, the new company requested that the government take over construction of the lines and in 1881 the Railway Bureau undertook the project. Of the early difficulties encountered, Inouye writes, "Unfortunately, the company was not originally promoted by shareholders who understood the benefits of railways, but by persons encouraged by the profits guaranteed by the Government; consequently, there were always internal troubles of some sort arising. Moreover, considerable difficulty was experienced in collecting the share capital. Under these circumstances the work of construction was not commenced until 1881-2, when the amount of 300,000 yen was borrowed from the Treasury."<sup>2</sup> It was

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<sup>1</sup> Inouye, op.cit., p. 438.

<sup>2</sup> Ibid.

ten years later, in 1891, that the 450 mile stretch between Tōkyō and Aomori was completed.

Numerous other private companies arose through liberal government subsidies. In 1886, two large companies were formed under the name of the Sanyō Railway and the Kyūshū Railway Company; the former to connect Kōbe with Shimonoseki and the latter to connect Moji, Nagasaki and Yatsushiro. In November, 1888, the first section of the Sanyō line from Kōbe to Himeji was opened. In 1889, the Kyūshū line opened its first section from Hakata to Kurume, a distance of twenty-two miles. By 1891, the Kyūshū Railway was opened as far as Saga and the Sanyō Railway to Onomichi.

In 1884 the Hankai (now the Nankai) Railway Company was formed and a road built from Ōsaka to Sakai. The Kansai Railway Company (Ōsaka to Nagoya) was formed in 1888 and the Sangu, in 1890. In Shikoku there was established the Iyo Railway Company in 1886 and the Sanuki in 1888, the latter being subsequently amalgamated with the larger Sanyō line. In Kyūshū, the Chikuhō Colliery Line came into existence in 1889 and the Hoshū line (from Kokura) in 1890. Both were later combined with the Kyūshū Railway.

In June, 1892, under the Law of Railroad Construction there was a great extension of railroads. Shortly after the Sino-Japanese War the business boom brought out a large number of small railway companies. By the close of 1898 there were 3,400 miles of railway in Japan of which 768 were state owned and the rest worked by private companies. It was at this time that the government was engaged in building the Sanin and Kagoshima lines.

By 1906, the year of the nationalization of the private railways, and thirty-four years after the opening of the first railway line, there was a total of over 5,000 miles of state and privately owned railroads. It was on May 20, 1907 that a railway celebration was held in ~~Na~~goya to commemorate the completion of 5,000 miles.<sup>1</sup>

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<sup>1</sup> Unno, op.cit., p. 7.

## IV. (b) THE NATIONALIZATION OF THE PRIVATE LINES

Had it not been for financial considerations, nationalization would have been realized from the start. The government had been obliged under circumstances of temporary expediency to grant private charters though it always included the provision of its right to purchase the company. For a number of years certain elements in Japan had been agitating for a more complete control of railways. The monopoly which the government had acquired in camphor, tobacco and salt proved an easy means of increasing the national revenue and it resolved on the nationalization of railways for the same purpose. The military group was also a strong advocate of the movement, and the war with Russia gave it great impetus. The Russo-Japanese War, which was a test not so much of the military strength of the two combatants as of their respective means of communication and concentration, served to impress the importance of railways upon the Japanese. The Japanese must have realized that a contributing factor to their victory was to be found in the transport deficiencies of the Trans-Siberian Railroad. When on March 6, 1906, after the war with Russia, the famous Katsura cabinet was succeeded by the Saionji ministry, the administration took up the plan for nationalizing all the most important railways of Japan.

The first bill for railway nationalization was introduced in the Diet in November of 1891, by the Matsukata Cabinet, but it failed to get a majority. Early in 1899 the bill again appeared in the Diet under the Yamagata Cabinet, and it again

failed to pass. In the following year a modified bill for the purchase of private railways was introduced by the same cabinet and again it failed. The Saionji cabinet was successful however, after prolonged and bitter discussion in finally getting a "Railway Nationalization Law" passed. In one of the debates prior to passage of the nationalization bill, Minister of War, Terauchi, said, "National defense is defensive and offensive, and systematically related railways are necessary not only to passive but to active protection."<sup>1</sup> The government also claimed that the terms of its concessions to the private railways prevented it from making a reduction in rates, which was regarded as essential in the interest of the country. The state claimed that government ownership would make for a more efficient service and for the inter-change of equipment between all lines.

The government, by the law of eminent domain, took over 2,823 miles of private railway at a total cost of \$250,000,000.<sup>2</sup> Payment was made in public loan bonds bearing interest at five percent, redeemable in forty-five years. The payment received by the owners of the private railways was calculated at "twenty times the average net profits for the three years preceding the war with Russia, 1902-05, an arrangement which represented a handsome profit to private owners."<sup>3</sup> The purchase of the seventeen private companies which came under the Nationalization Law was completed in eighteen months instead of ten years as prescribed in the original bill.

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<sup>1</sup> Watarai, op.cit., p. 55.

<sup>2</sup> Middleton, op.cit., p.242. See appendix for list of private lines purchased.

<sup>3</sup> Ibid.

Uehara lists some of the results of nationalization as follows:

1. The improvement of the service.
2. The extension of the railways to remote districts which private companies could hardly exploit.
3. The lowering of passenger and goods tariffs, in spite of advanced wages and other expenses.
4. Profits amounted on the average to 5.8 percent of the capital invested in spite of greater outlay, and the railway department is enabled to meet the colossal amount of interest on Railway Loans, subsidies to private railway companies, and the reserve fund for construction and improvement.<sup>1</sup>

The private railways which still exist are of merely local importance. They are governed by the law on local railways and receive state subsidies for their services.<sup>2</sup> Despite some criticism of the state owned lines, financial results compare favorably with other countries and in general the railways have been operated very efficiently.

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<sup>1</sup> Shigeru Uehara, The Industry and Trade of Japan (London, 1936), p. 198.

<sup>2</sup> Paul Wohl and A. Albitreccia, Road and Rail in Forty Nations (London, 1935), p. 231.



#### IV. (c) RAILWAY DEVELOPMENT AFTER THE NATIONALIZATION OF PRIVATE LINES

The general plan for a network of State Railways was presented in the form of the Railway Construction Law of 1892. This law, approved by the Diet, embodied a comprehensive program of railway building giving the foundation for the railway system in Japan as it exists today. After the nationalization, the programs of construction and improvement had to be changed somewhat to fit the altered circumstances. For example, new construction took place to connect the state railways with the former private railways. Improvements incidental to the incorporation of the private railways were also undertaken.

In the period between 1906-7 and 1914-15 a total of 1,343 miles of new line were constructed or, an average of 149.3 miles per year.<sup>1</sup> The new lines constructed during this period required a larger expenditure of funds per railroad mile. This was accounted for by the rise in wages and material costs following the Russo-Japanese War, as well as by the fact that the new construction work was being extended to remoter and more mountainous districts and hence greater engineering difficulties had to be dealt with. Construction after the nationalization did not proceed as rapidly as before the nationalization. In the period between 1893-94 and 1904-5 the average construction was 193.5 miles per year or about 44 miles more per year than in the period following nationalization. An explanation of the decreased rate of new line construction immediately following the nationalization may be found in the

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<sup>1</sup> Japan, Department of Railways, Annual Report, 1917, p.21.

fact that traffic grew rapidly after the consolidation of the lines and added demands were placed on rail communications as a result of the rapid economic development which was taking place. As a result of these factors, more money and effort was put into work providing greater facilities such as addition of trackage, improvement of permanent way and bridge girders, provision of new equipment, the extension of stations and railway yard accommodations and, rail-and-water link facilities. The improvement demanded by the enormous growth of traffic on the Tokaido line involved comparatively large outlays of capital.

In 1922, after the Ministry of Railways conducted a study of state lines and future needs, some new lines were added to the original program as embodied in the Railway Construction Law, resulting in the mapping of a more complete network of railways.<sup>1</sup> By 1935 the Japanese rail net was substantially complete and it is not likely that there will be any great increase in mileage in the future. Improvement in the future lies in better service and equipment and more electrification as well as in the use of new traffic control techniques and more efficient management. Limitations of the terrain serve to prevent the realization of major economies from the elimination of curves and the leveling of gradients.

During the recent war, there were unprecedented demands placed on Japan's railroads. The diversion of shipping for troop and material transport to the distant battlefronts necessitated greater use of railway freight facilities. In October, 1942, an

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<sup>1</sup> Japan, Dept. of Railways Annual Report, 1936, p.3.

Imperial decree ordered all the coal and steel from the main mining and refining area around Moji and Yawata to be transported by rail to the industrial areas of Kōbe and Ōsaka.<sup>1</sup>

Previously, the bulk of traffic in heavy cargo between these points had been carried by ship through the Inland Sea. This serves to emphasize an important characteristic of Japanese railways. In contrast to Western railways, the amount of freight revenue has been smaller than passenger revenue in Japan. This was due to Japan's island position and extensive development of coastwise shipping. It was this insular character of Japan which acted as a compensating factor in the slow development of railroads in 1870-1880 due to financial troubles. Economic progress in the new industrial state which the Japanese were building, depended on adequate means of transport and communication which the coastal water ways provided. The importance of Japan's insular character can be better understood if one considers that China due to her huge land mass has yet to develop adequate communications to aid her in moving forward on the road of economic development.

There can be no doubt that with the establishment of a normal peace time economy and after the construction of new shipping the bulk of Japanese freight will again be transported on coastal vessels.

Although all types of transportation suffered as a result of the war the railroads came through in reasonably good shape. Damage due to bombing was relatively light. This was due to

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<sup>1</sup> Clayton D. Carus and Charles McNichols, Japan - Its Resources and Industries (New York, 1944), p. 96.

the fact that the railways were not classed as a strategic target but were considered a tactical target to be bombed previous to invasion of the homeland. A reversal in this policy took place in July, 1945, and railroads were awarded top target priority.<sup>1</sup> The war ended before this new policy could be implemented.

During the war, efficient operation of the railways suffered from such factors as over-taxing of capacities, lack of proper maintenance and the withdrawal of personnel and materials for military purposes. Wartime railway freight tonnage increased 265 percent from 1936 to 1944.<sup>2</sup> Most of the increase was due to reduction of passenger traffic, overloading of freight cars and transfer of rolling stock to busy lines. According to Japanese government reports to SCAP, passenger traffic decreased one-half to one-third during the war.<sup>3</sup> The passenger congestion following the close of the war down to the present time is primarily due to large turnovers in population, movement of displaced persons and scarcity of motor transport. Further aggravating the situation is the lack of sufficient coal for normal railway operations. Regarding roadbeds, rolling stock and plant capacity for construction and maintenance, the present condition of Japanese Railways is considered adequate to meet the needs of the immediate future.<sup>4</sup>

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<sup>1</sup> United States Strategic Bomb Survey, The Effect of Strategic Bombing on Japan's War Economy (Washington, D.C., 1946), p.65.

<sup>2</sup> Supreme Commander for the Allied Powers, Summation of Non-Military Activities in Japan and Korea, No.1, Sept., Oct., 1945, p.65.

<sup>3</sup> Ibid.

<sup>4</sup> Department of State Intelligence Research Report, A Provisional Survey of Japan's Railroad Rolling Stock Requirements in 1950. (Washington, D.C., 1946), p. 11.

## V. SOCIAL AND ECONOMIC EFFECT OF THE RAILWAYS

As in other countries of the world, so in Japan, the development of a railway type of transportation had a far-reaching effect upon practically every phase of national life and activity.<sup>1</sup> This new mode of transportation was especially significant in Japan for it synchronized with the social and industrial revolution which accompanied the new political reforms of the Meiji regime which sought rapid Westernization in direct contrast to the exclusionism of the Tokugawa Shōgunate. This circumstance of simultaneous developments in both social-political reforms and in the industrial and commercial fields, added much to the importance of the role played by the railway in Japan's modernization. Politically, it served to further the strength of the central government by bringing the independent feudal units into a compact national organization. Socially, the new facility for travel aided in the interchange of ideas helping to broaden the mental horizon of the people from a local to a nationwide outlook and at the same time aided in the abolition of feudalism. Economically, the effects were similar to those of the industrial nations of the West. The prompt delivery of large quantities of products, which was made possible with rail transportation, fostered the growth of large-scale production, resulted in some specialized industries arising in particular areas of the country and transferred the economy from one limited to small local areas to one of national and finally international importance.

<sup>1</sup> Imperial Government Railways, Honpo Tetsudo no Shakai oyobi Keizai ni oyoboseru Eikyo 本邦鐵道の社會及び經濟に及せる影響 (Social & Economic effects of the National Railways), Tokyo, 1916.

In Japan, as is well known, the most important agricultural activity deals with rice, which is grown throughout the country. The annual crop, therefore, and its market vitally affect the purchasing power of the agricultural population. Often, the rice quotations were a general indication of the condition of the market. The railways were instrumental in promoting a re-organization of some arable land for as a rule, railroads were laid over flat country which in Japan is almost synonymous with rice fields. The construction of railway embankments has, in many instances, resulted in the obstruction of the natural supply and drainage of water, consequently deranging the irrigation system. One of the main benefits to the rice farmer resulting from railway transportation was the reduction of the cost of carriage and consequent extension of markets for farm produce. The resulting uniformity of prices throughout the country no longer subjected the farmer to the disastrous effects of the extremes of scarcity and over-abundance which too often affected seriously his economic position. Famines which were almost chronic in the past and taken as an inevitable natural phenomenon, have now become, in Japan, a matter of historical interest. The new and enlarged markets opened to the farmer stimulated the production of greater quantities and better qualities of crops.

An example of the railroad effecting the localization of an industry is to be found in the tea industry of Shizuoka Ken. Before the opening of the Tōkaidō Honsen, the refining of tea for foreign consumption was in the hands of foreign

merchants in Yokohama and Kōbe. When Shizuoka, the center of the tea-industry, was brought into rail connection with Yokohama and Kōbe, the business of refining was brought back to the tea producing area. As with other products, here too, the decrease in cost of transportation and the extension of markets has brought to the consumer a larger supply of tea at lower prices. Vegetable gardening was affected similarly for the new transportation enabled urban dwellers to draw from wider sources of supply and the good markets brought nearer to the farmer encouraged the extension of vegetable gardening to the point where they have become a lucrative by-occupation of the farmers living at a considerable radius from the consuming centers.

The railways played a great part in the distribution of marine products throughout Japan. In the days of slow, and costly transport, raw, fresh fish were a luxury for dwellers far from the sea-coasts who had to be contented with dried or salted fish. Salt was another of Japan's industries which felt the benefits of rail transport. Salt, being a highly localized product of the shores of the Inland Sea area, had a limited market for the output of each salt-field and resulted in price differences throughout the country. In Tokugawa times, salt was a valuable commodity in the distant Tōhoku region around Sendai, Morioka, and Aomori. The extension of the railways did much to equalize salt prices, though nationalization of the salt industry also helped in this direction.

Previous to the development of railways, timber was trans-

ported by means of sea-routes and inland waterways. Timber which was destined for Tōkyō from Aomori was sent by the sea route to Yokohama and then made into a raft and hauled to Tōkyō. Much time and energy was consumed in such a process. The railroad changed all that. The opening of the Tōhoku line enabled the northeastern part of Japan to compete with the Central (Chūbu) region for the timber markets in Tōkyō. Also, timber from the Central region which formerly was sent down the Kiso River to Nagoya, was diverted to the Chūō line and transported directly to Ōsaka and other points.

Cheaper transportation of the bulky products of the coal mines has had its effect in the exploitation of mines in more remote regions in such as the northeastern part of Honshū and in Hokkaidō. The importance of railways in connection with the development of mines may be seen from the production figures of the Joban colliery. In 1895 or two years before the opening of the Joban Line along the Pacific seaboard, north of Tōkyō, the output of the colliery was 30,335 tons. In 1897, when the district was connected to Tōkyō by rail, output increased to 84,693 tons. The figures for 1901, 1911 and 1913 were 178,134, 493,860 and 598,515 tons respectively.<sup>1</sup>

Sericulture, which had developed into a large industry in Japan before the war and which produced one of Japan's greatest export products could not have gained its importance had a modern efficient means of transport been lacking. In the era of poor transport, sericulture and silk-reeling were carried

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<sup>1</sup> Japan, Department of Railways, Annual Report, 1917, p. 102.



on as a domestic industry of the farming class, with the inherent drawbacks in the system of a lack of uniformity in the quality of the filaments. The railways offered facilities for the safer and prompter conveyance of mulberry leaves, egg-cards and even cocoons, to a greater distance. This coincided with the building of large silk mills whose demands could not be supplied locally and thus drew from distant points the raw materials for the production of silk. Thus, the era of large scale production was ushered in, resulting in the localization of mulberry tree planting, sericulture and the silk-reeling industries. The prosperity of Nagano-Ken, a mountainous province in the Chūbu area, is largely due to the extension of the railroads. Previous to the opening of the Shin-Etsu and Chūō Lines, the raw cocoons from the neighboring districts had to be brought in small carts over a series of mountain passes which lead to the silk mills at Okaya and Suwa. This type of transport was very slow due to bad roads and the wet weather conditions prevailing at the season (June to September) when cocoons are ready for the mill. Apart from the delay in transit, much damage was incurred to the perishable cocoon. The railroad connection to the silk mills was a boon to the milling interests for it gave them an ample supply of cocoons not only from distant parts of Japan but from China as well.

The railroads had a disruptive effect upon other modes of transportation. It was inevitable that the introduction of Western methods and power driven machinery would cause the injury of some classes of people and occupations. The opening of

Japan to foreign trade caused certain groups of producers to be injured. Regarding this occupational displacement S. Ōkuma wrote, "A vast number of occupations which had hitherto been thriving had suddenly to be abandoned, and skilled labourers and artisans were thrown out of employment in thousands. Moreover, all kinds of monopolies and business privileges which the daimyo granted to their favourite merchants and to themselves ceased to exist with the fall of feudalism."<sup>1</sup> It was unavoidable that the railroad, with its greater speed and better facilities, would take over the traffic which previously utilized wagons, palanquins, and jinrikishas and consequently disrupt certain occupational classes. The jinrikisha pullers were most affected by railway competition. It was during the period of the Meiji Restoration that the rikisha came into vogue replacing the Japanese palanquin or kago. It was in the fifth year of Meiji (1872) that the jinrikisha was first introduced in Shizuoka prefecture.<sup>2</sup> Anti-railway agitation was started by rikisha-men in some places. In the case of the Sangu Railway, leading to the Great Shrine at Ise, some rikisha-men, backed by innkeepers, petitioned the government to abandon railway construction. The decline in the jinrikisha mode of transportation may be seen in the figures for licensed rickshaws throughout the country. The number declined from 204, 419 in 1898 to 126,846 in 1913.<sup>3</sup>

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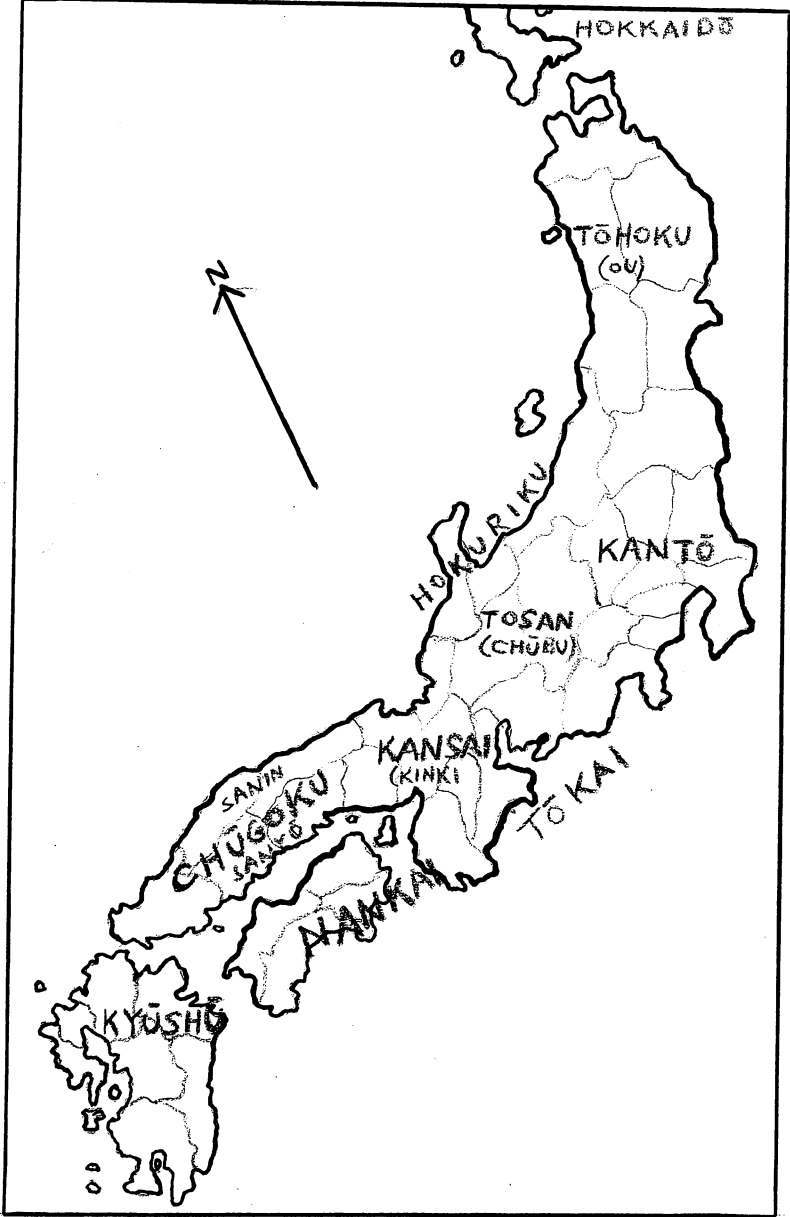
<sup>1</sup> S. Ōkuma, "The Industrial Revolution in Japan", in North American Review, Vol. 171, quoted by Allen, op.cit., p. 31.

<sup>2</sup> Hall, op.cit., p. 363.

<sup>3</sup> Japan, Department of Railways, op.cit., p. 103.

Many of the foregoing effects of railways on social and economic activity were not peculiar to Japan. They are more characteristic of the fundamental changes which any non-industrial country would experience with the introduction of a "Revolution of Industry." Money came to predominate over land, cities and towns grew rapidly, trade and industry developed and the spirit of nationalism was strengthened through the spread of education and the circulation of printed matter. In the great migrations from rural areas to budding centers of industry, Japan only repeated the history of Western European countries and of the United States. Here too, it may be said that the railway played its part in the growth of the great cities of Japan. Also, the rapid expansion of suburban communities is due in no small measure, as in the United States, to the development of rapid inter-urban transit facilities.

MAP OF TRADITIONAL REGIONS



ROUTE OF THE NAKASENDŌ  
(from Tōkyō - West)

\*

|           |             |            |
|-----------|-------------|------------|
| Itabashi  | Wada        | Ota        |
| Warabi    | Suwa        | Urauma     |
| Ōmiya     | Seba        | Kano       |
| Kumagaya  | Niegawa     | Akasaka    |
| Hongo     | Narai       | Tarui      |
| Takasaki  | Yagohara    | Sekigahara |
| Annaka    | Fukushima   | Tokamiya   |
| Matsuida  | Nojiri      | Furuigawa  |
| Sakamoto  | Tsumago     | Musa       |
| Karuizawa | Magome      | Moriyama   |
| Katsukake | Nakatsugawa | Kusatsu ** |
| Oiwake    | Oi          |            |

\*\* juncture with the Tōkaidō Line.

ROUTE OF THE KŌSHŪ KAIDŌ\*

|          |                         |
|----------|-------------------------|
| Tōkyō    | Obara                   |
| Tōkaidō  | Uenohara                |
| Fuchū    | Sarubashi               |
| Hachioji | Kōfu                    |
| Kobatake | Suwa (on the Nakasendō) |

\* Edward G. Holtham, Eight Years in Japan 1873-1881 (London, 1883).

## GAUGES OF RAILROADS IN JAPAN\*

(Status as of Sept. 1, 1939)

| Railroad and Headquarters  | Gauges              | Mileages of Gauges                  |
|--|---------------------|-------------------------------------|
| Aichi Electric Railway - Nagoya  | 1067 mm             | 76                                  |
| Hanshin Electric Railway-Amagasaki City  | 4'8.5"              | 45                                  |
| Hanshin Kyūkō(Express) Electric Railway - Ōsaka                                      | 4' 8.5"             | 48                                  |
| Hanwa Electric Railway - Ōsaka   | 1067 mm             | 39                                  |
| Imperial Govt. Railways of Japan-Tōkyō   | 1067 mm             | 11,229 of which 655 are electrified |
| Keihan Electric Railway - Kawasaki   | 1372                | 18                                  |
| Keihin Electric Railway - Ōsaka  | 1435                | 35                                  |
| Keisei Electric Tramway - Tōkyō  | 1372                | 52                                  |
| Meikei Railway - Nagoya  | 1067                | 111                                 |
| Nankai Railway - Ōsaka   | 1067                | 78                                  |
| Odawara Kyūkō (Express) Electric Railway - Tōkyō                                     | 1067                | 70                                  |
| Ōsaka Electric Tramway - Ōsaka   | 1435<br>1067<br>762 | 82                                  |
| Sangu-Kyūkō (Express) Electric Railway-Ōsaka   | 1067<br>1435        | 139                                 |
| Tōbu Railway, Tōkyō<br>226 miles of railway are elec.<br>29 " " tramway " "          | 1067                | 243 ry.<br>35 tramway               |
| Tōkyō Underground Railway - Tōkyō<br>Electric traction<br>7 miles under construction | 48.5"               | 5                                   |

1067 mm. = 3'6" gauge; 1372 mm = 4'6" gauge; 1435 mm = 4'8.5" g  
= Stephenson or Standard gauge; 762 mm = 2'6" g.

\*Gauges of Railways in Asia, July 23, 1945, Bureau of Railway Economics Library, Assoc. of Amer. Railroads.

QUINQUENNIAL RETURNS SHOWING PROGRESS OF STATE OWNED AND  
PRIVATE RAILWAYS FROM THE OUTSET TO 1905-06 THE YEAR PRIOR TO CARRYING INTO  
EFFECT THE RAILWAY NATIONALIZATION LAW.

| Fiscal Year | Ownership | Mileage<br>Open | Locomotives | Carriages | Wagons | Construction<br>Expenses |
|-------------|-----------|-----------------|-------------|-----------|--------|--------------------------|
| 1872-3      | State     | 18.0            | 10          | 58        | 75     | 3,038,672                |
|             | Private   | --              | --          | --        | --     | -----                    |
|             | Total     | 18.0            | 10          | 58        | 75     | 3,038,672                |
| 1875-6      | State     | 33.3            | 32          | 146       | 203    | 7,565,386                |
|             | Private   | --              | --          | ---       | ---    | -----                    |
|             | Total     | 33.3            | 32          | 146       | 203    | 7,565,386                |
| 1880-1      | State     | 98.3            | 38          | 186       | 474    | 11,658,253               |
|             | Private   | --              | --          | ---       | ---    | -----                    |
|             | Total     | 98.3            | 38          | 186       | 474    | 11,658,253               |
| 1885-6      | State     | 223.8           | 56          | 325       | 855    | 16,315,260               |
|             | Private   | 134.7           | 16          | 77        | 209    | 3,106,253                |
|             | Total     | 358.5           | 72          | 402       | 1064   | 19,421,513               |
| 1890-1      | State     | 550.6           | 114         | 612       | 1,466  | 32,760,841               |
|             | Private   | 848.6           | 140         | 605       | 1,921  | 33,815,795               |
|             | Total     | 1,399.2         | 254         | 1,217     | 3,387  | 66,576,636               |
| 1895-6      | State     | 593.3           | 171         | 705       | 2,235  | 39,279,435               |
|             | Private   | 1,697.2         | 351         | 1,238     | 5,156  | 68,666,412               |
|             | Total     | 2,290.5         | 522         | 1,943     | 7,391  | 107,945,847              |
| 1900-1      | State     | 949.9           | 387         | 1,085     | 4,291  | 85,573,511               |
|             | Private   | 2,905.2         | 892         | 3,331     | 14,046 | 191,230,391              |
|             | Total     | 3,855.1         | 1,279       | 4,416     | 18,337 | 276,803,902              |
| 1905-6      | State     | 1,531.8         | 594         | 1,668     | 8,236  | 159,918,445              |
|             | Private   | 3,251.2         | 1,123       | 3,672     | 18,947 | 251,640,591              |
|             | Total     | 4,783.0         | 1,717       | 5,340     | 27,183 | 411,559,035              |

Note- For Gov't Rys., the fiscal year 1872 was in the lunar calendar. Years 1875 to 1880 consisted of 12 months from July 1st to June 30th according to solar calendar. After 1885 a fiscal year covers twelve months from April 1st to March 31st. In private companies the business years were not uniform, some following a calendar year and others the financial year adopted by the Government Railways.

## DATA RELATING TO THE NATIONALIZED RAILWAYS

|     | Name of Railway | Date of Purchase | Traffic Mileage     | Price Yen   |
|-----|-----------------|------------------|---------------------|-------------|
| 1.  | Hokkaidō Tanko  | Oct. 1, 1906     | 207 miles 51 chains | 30,997,088  |
| 2.  | Kobu            | Oct. 1, 1906     | 27                  | 14,599,547  |
| 3.  | Nippon          | Nov. 1, 1906     | 860                 | 142,523,532 |
| 4.  | Sanyō           | Dec. 1, 1906     | 414                 | *28,412     |
| 5.  | Kyūshū          | July 1, 1907     | 446                 | 80,416,947  |
| 6.  | Hokuryetsu      | Aug. 1, 1907     | 85                  | *1,567,047  |
| 7.  | Sobu            | Sept. 1, 1907    | 73                  | 118,856,448 |
| 8.  | Kwansai         | Oct. 1, 1907     | 280                 | 7,776,887   |
| 9.  | Sangū           | Oct. 1, 1907     | 26                  | 12,781,155  |
| 10. | Ganyetsu        | Nov. 1, 1906     | 49                  | 36,129,873  |
| 11. | Nishinari       | Dec. 1, 1906     | 4                   | 5,728,901   |
| 12. | Hokkaidō        | July 1, 1907     | 158                 | 2,521,498   |
| 13. | Kyōto           | Aug. 1, 1907     | 22                  | 2,184,058   |
| 14. | Hankoku         | Aug. 1, 1907     | 70                  | *479,550    |
| 15. | Boso            | Sept. 1, 1907    | 39                  | 11,452,097  |
| 16. | Nanao           | Sept. 1, 1907    | 34                  | 3,341,040   |
| 17. | Tokushima       | Sept. 1, 1907    | 21                  | 7,592,616   |
|     |                 |                  |                     | *583,103    |
|     |                 |                  |                     | 2,156,998   |
|     |                 |                  |                     | 1,491,355   |
|     |                 |                  |                     | 1,341,432   |
|     | TOTAL           |                  | 2823                | 481,981,472 |
|     |                 |                  | 69                  | *2,658,112  |

Note - Figures marked with asterisk (\*) denote the price paid for subsidiary business, which is included in the total sum.

Purchase price determined by mutual agreement between parties.

Purchase price determined according to rate of profit.



COMPARISON OF JAPANESE TRAIN SPEEDS ON SELECTED RUNS  
IN 1889, 1935, and 1945\*

666

| From      | To          | Distance<br>in<br>miles                 | April, 1889       |                   | March 1935                   |                   | December 1945                |                   |
|-----------|-------------|---|-------------------|-------------------|------------------------------|-------------------|------------------------------|-------------------|
|           |             |   | Time              | Speed<br>m. p. h. | Time                         | Speed<br>m. p. h. | Time                         | Speed<br>m. p. h. |
| Tōkyō (a) | Yokohama    | 18                                      | 40 min(exp)<br>55 | 27<br>20          | 27min.(exp)<br>38            | 40<br>29          | ----<br>35min                | --<br>31          |
| Tōkyō (b) | Hamamatsu   | 167<br>160                              | 7h55m<br>-----    | 21<br>--          | --<br>3h58m "<br>5h56m(reg)  | --<br>40<br>27    | ----<br>5h52m<br>6 28        | --<br>27<br>25    |
| Otsu<br>" | Kyōtō<br>"  | 11 $\frac{1}{4}$<br>6 $\frac{1}{4}$ (c) | 51m<br>--         | 13<br>--          | --<br>10m (exp)<br>16m (reg) | --<br>37.5<br>23  | ----<br>11m(exp)<br>14m(reg) | --<br>34<br>27    |
| Kyōtō     | Ōsaka       | 26 $\frac{1}{4}$                        | 1h40m             | 16.5              | 34' (exp)<br>40' (reg)       | 47.3<br>40        | 45min                        | 36                |
| Ōsaka     | Kobe        | 20                                      | 1h10m             | 17.3              | 32' (exp)<br>33' (reg)       | 38<br>37          | 40min                        | 34                |
| Kobe      | Himeji      | 34.5                                    | 2h10m             | 16                | 54' (exp)<br>65' (reg)       | 38<br>32          | 59'<br>80'                   | 35<br>26          |
| Ōsaka     | Hiroshima   | 211.5                                   | ---               | --                | 6h18m<br>7 34                | 34<br>28          | 8hr7min                      | 26                |
| Hiroshima | Shimonoseki | 126.4                                   | ---               | --                | 3 45<br>5 0                  | 38<br>25          | 5 27                         | 23                |

\* Compiled from Japanese Gov't. Ry. Time Tables for April 1889, March 1935 and Dec '45

A. Trains making runs to points beyond Yokohama

b. Tōkyō-Numazu 1889 TimeTable 86.5 miles; 1935 TimeTable 79.0 miles.

c. Distance shortened through greater number of tunnels & bridges.

LENGTH OF OPEN LINES AS OF MARCH, 1936\*  
(in Kilometers)

| Kinds of Track:<br><u>Region</u> | Single     | Double    | Triple | Quadruple<br>and<br>over | Total      |
|----------------------------------|------------|-----------|--------|--------------------------|------------|
|                                  |            |           |        |                          |            |
| Tōkyō                            | 1320.160   | 616.251   | 2.910  | 128.588                  | 2,067,909  |
| Nagoya                           | 1762.292   | 314.108   | 11.163 | -----                    | 2,087,562  |
| Ōsaka                            | 1736.961   | 197.287   | 4.660  | 30.887                   | 1,999,795  |
| Hiroshima                        | 1557.696   | 470.668   | -----  | -----                    | 2,028,364  |
| Mōji                             | 2133.083   | 147.176   | 9.360  | 4.110                    | 3,293,729  |
| Sendai                           | 3251.056   | 29.851    | 1.870  | -----                    | 3,282,777  |
| Sapporo                          | 3100.630   | 169.599   | -----  | -----                    | 3,270,229  |
| Total                            | 14,861.878 | 1,944.939 | 29.963 | 193.585                  | 17,030,365 |

\* From "Annual Report" Dept. of Railways, Japan, 1936, p. 4.

MAIN LINES AND MILEAGE UNDER TRAFFIC  
(End of March, 1937)

| <u>Name of Line</u> | <u>Open Lines<br/>Inclusive of<br/>Branch Lines (KMS)</u> |
|---------------------|---|
| <u>Honshū</u>       |   |
| Ban-etsu            | 337.2   |
| Chūō                | 743.0   |
| Hokuriku            | 638.1   |
| Takayama            | 298.0   |
| Kansai              | 852.7   |
| O-u                 | 902.8   |
| Riku-u              | 165.0   |
| Sanyō               | 1,387.4   |
| Sanin               | 1,014.1   |
| Shin-etsu           | 449.7   |
| Sobu                | 524.2   |
| Tōhoku              | 2,498.5   |
| Tōkaidō             | 1,000.3   |
| U-etsu              | 288.5   |
| <u>Kyūshū</u>       |   |
| Chikuhō             | 154.8   |
| Hohi                | 165.7   |
| Kagoshima           | 746.4   |
| Nagasaki            | 400.5   |
| Nippō               | 749.0   |
| Kyūdai              | 141.5   |
| <u>Shikoku</u>      |   |
| Dosan               | 169.7   |
| Kotoku              | 88.3  |
| Tokushima           | 110.7   |
| Yosan               | 291.2   |
| <u>Hokkaidō</u>     |   |
| Abashiri            | 260.9   |
| Hakodate            | 831.0   |
| Semmo               | 198.1   |
| Muroran             | 292.4   |
| Nayoro              | 226.5   |
| Nemuro              | 690.3   |
| Rumoi               | 127.4   |
| Soya                | 477.0   |
| Sekihoku            | 181.0   |
| Hidaka              | 128.2   |
| GRAND TOTAL         | 17,530.1  |

JAPAN'S POSITION IN RAILWAYS  
(End of 1936)

| Country        | Railways<br>In Operation | No. of<br>Loco-<br>motives | No. of<br>Passenger<br>Cars | No. of<br>Goods<br>Wagons |
|----------------|--------------------------|----------------------------|-----------------------------|---------------------------|
| Japan Proper*  | 17,530                   | 4,235                      | 9,656                       | 73,184                    |
| United States  | 640,269                  | 45,146                     | 41,390                      | 1,790,043                 |
| Germany        | 123,667                  | 20,710                     | 64,009                      | 578,325                   |
| United Kingdom | 81,484                   | 19,864                     | 42,656                      | 618,948                   |
| Italy          | 29,562                   | 5,891                      | 7,464                       | 126,164                   |

\* Fiscal Year Ending March 31, 1937.

From The Japan-Manchoukuo Year Book, 1939, p. 225.

JAPAN'S COMPARATIVE POSITION WITH RESPECT TO  
RAILROADS-1939

| <u>Country</u> | <u>Length<br/>in Km.</u> | <u>Per 100 Sq.<br/>Km. of Area</u> | <u>Per<br/>10,000<br/>Population</u> |
|----------------|--------------------------|------------------------------------|--------------------------------------|
| Japan Proper   | 24,843*                  | 6.5                                | 3.6                                  |
| United States  | 405,279                  | 5.2                                | 31.2                                 |
| Germany        | 54,556                   | 11.6                               | 8.0                                  |
| England        | 32,317                   | 14.1                               | 7.0                                  |
| China          | 13,086                   | 0.1                                | 0.3                                  |

\* Tram-lines subtracted.

From the Far East Year Book, 1941, p. 190.

# GROWTH OF JAPANESE RAILWAYS 1872-1935

STATE LINES  
PRIVATE LINES  
TOTAL MILEAGE

IN THOUSANDS OF MILES



TABLE OF GROWTH OF RAILWAY MILEAGE AND ROLLING STOCK

# RAILWAY MILEAGE AND ROLLING STOCK OF THE JAPANESE RAILWAYS

| YEAR      | MILEAGE OPEN TO TRAFFIC |                  |                |                  |                |                  | ROLLING STOCK  |                  |       |                |                  |       |                |                  |       |
|-----------|-------------------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|-------|----------------|------------------|-------|----------------|------------------|-------|
|           | STATE RYS.              |                  | PRIVATE RYS.   |                  | TOTAL          |                  | LOCOMOTIVES    |                  |       | PASSENGER CARS |                  |       | FREIGHT WAGONS |                  |       |
|           | STATE RAILWAYS          | PRIVATE RAILWAYS | STATE RAILWAYS | PRIVATE RAILWAYS | STATE RAILWAYS | PRIVATE RAILWAYS | STATE RAILWAYS | PRIVATE RAILWAYS | TOTAL | STATE RAILWAYS | PRIVATE RAILWAYS | TOTAL | STATE RAILWAYS | PRIVATE RAILWAYS | TOTAL |
|           | miles                   | chains           | miles          | chains           | miles          | chains           | miles          | chains           | miles | miles          | miles            | miles | miles          | miles            | miles |
| 1872      | 18                      | 00               | —              | —                | 18             | 00               | 10             | —                | 10    | 58             | —                | 58    | 75             | —                | 75    |
| 1873      | 18                      | 00               | —              | —                | 18             | 00               | 10             | —                | 10    | 58             | —                | 58    | 75             | —                | 75    |
| 1874      | 38                      | 27               | —              | —                | 38             | 27               | 22             | —                | 22    | 144            | —                | 144   | 157            | —                | 157   |
| 1875      | 38                      | 27               | —              | —                | 38             | 27               | 24             | —                | 24    | 148            | —                | 148   | 190            | —                | 190   |
| 1875-1876 | 38                      | 27               | —              | —                | 38             | 27               | 32             | —                | 32    | 146            | —                | 146   | 203            | —                | 203   |
| 1876-1877 | 65                      | 11               | —              | —                | 65             | 11               | 34             | —                | 34    | 156            | —                | 156   | 255            | —                | 255   |
| 1877-1878 | 65                      | 11               | —              | —                | 65             | 11               | 38             | —                | 38    | 160            | —                | 160   | 320            | —                | 320   |
| 1878-1879 | 65                      | 11               | —              | —                | 65             | 11               | 38             | —                | 38    | 166            | —                | 166   | 363            | —                | 363   |
| 1879-1880 | 73                      | 22               | —              | —                | 73             | 22               | 38             | —                | 38    | 173            | —                | 173   | 413            | —                | 413   |
| 1880-1881 | 76                      | 37               | —              | —                | 76             | 37               | 36             | —                | 36    | 178            | —                | 178   | 445            | —                | 445   |
| 1881-1882 | 100                     | 38               | —              | —                | 100            | 38               | 45             | —                | 45    | 203            | —                | 203   | 527            | —                | 527   |
| 1882-1883 | 114                     | 63               | —              | —                | 114            | 63               | 47             | —                | 47    | 240            | —                | 240   | 503            | —                | 503   |
| 1883-1884 | 125                     | 51               | 63             | 00               | 188            | 51               | 48             | 7                | 55    | 299            | 47               | 346   | 626            | 101              | 727   |
| 1884-1885 | 125                     | 51               | 80             | 63               | 206            | 34               | 46             | 12               | 58    | 303            | 70               | 373   | 691            | 110              | 801   |
| 1885-1886 | 167                     | 62               | 129            | 76               | 297            | 58               | 50             | 16               | 66    | 313            | 77               | 390   | 713            | 209              | 922   |
| 1886-1887 | 208                     | 64               | 165            | 77               | 374            | 61               | 47             | 25               | 72    | 312            | 119              | 331   | 762            | 241              | 1003  |
| 1887-1888 | 244                     | 40               | 293            | 24               | 537            | 64               | 53             | 30               | 83    | 313            | 138              | 451   | 887            | 364              | 1251  |
| 1888-1889 | 445                     | 19               | 406            | 38               | 851            | 57               | 73             | 55               | 128   | 431            | 238              | 669   | 1196           | 636              | 1832  |
| 1889-1890 | 550                     | 49               | 525            | 22               | 1075           | 71               | 95             | 82               | 177   | 520            | 367              | 887   | 1430           | 1132             | 2562  |
| 1890-1891 | 550                     | 49               | 848            | 43               | 1399           | 12               | 114            | 140              | 254   | 612            | 605              | 1217  | 1466           | 1921             | 3387  |
| 1891-1892 | 550                     | 49               | 1166           | 40               | 1717           | 09               | 124            | 169              | 293   | 617            | 685              | 1302  | 1685           | 2445             | 4130  |
| 1892-1893 | 550                     | 49               | 1320           | 26               | 1870           | 76               | 133            | 185              | 318   | 630            | 739              | 1369  | 1753           | 2819             | 4572  |
| 1893-1894 | 557                     | 49               | 1367           | 77               | 1925           | 46               | 142            | 211              | 353   | 647            | 806              | 1453  | 1851           | 3465             | 5316  |
| 1894-1895 | 580                     | 69               | 1537           | 33               | 2118           | 22               | 167            | 273              | 440   | 678            | 698              | 1376  | 2112           | 4301             | 6413  |
| 1895-1896 | 593                     | 22               | 1679           | 75               | 2273           | 17               | 171            | 351              | 522   | 705            | 1238             | 1943  | 2235           | 5156             | 7391  |
| 1896-1897 | 631                     | 62               | 1800           | 09               | 2431           | 71               | 183            | 429              | 612   | 796            | 1475             | 2271  | 2328           | 6582             | 8910  |
| 1897-1898 | 661                     | 65               | 2282           | 37               | 2944           | 22               | 258            | 636              | 894   | 871            | 2029             | 2900  | 2930           | 8541             | 11471 |
| 1898-1899 | 768                     | 37               | 2642           | 57               | 3411           | 14               | 317            | 786              | 1103  | 986            | 2877             | 3823  | 3295           | 10827            | 14122 |
| 1899-1900 | 833                     | 72               | 2802           | 49               | 3636           | 41               | 343            | 871              | 1214  | 1022           | 3129             | 4151  | 3729           | 12822            | 16551 |
| 1900-1901 | 949                     | 69               | 2905           | 16               | 3855           | 05               | 387            | 892              | 1279  | 1085           | 3331             | 4416  | 4245           | 14046            | 18291 |
| 1901-1902 | 1059                    | 48               | 2966           | 48               | 4026           | 16               | 407            | 943              | 1350  | 1822           | 3407             | 4529  | 5112           | 14708            | 19820 |
| 1902-1903 | 1226                    | 64               | 3010           | 64               | 4227           | 48               | 453            | 974              | 1427  | 1327           | 3537             | 4864  | 5644           | 15861            | 21505 |
| 1903-1904 | 1344                    | 70               | 3150           | 57               | 4495           | 47               | 513            | 1031             | 1544  | 1473           | 3628             | 5101  | 6332           | 16449            | 22781 |
| 1904-1905 | 1461                    | 38               | 3232           | 08               | 4693           | 46               | 552            | 1092             | 1644  | 1576           | 3666             | 5242  | 7018           | 17390            | 24408 |
| 1905-1906 | 1531                    | 58               | 3251           | 23               | 4783           | 01               | 594            | 1123             | 1717  | 1668           | 3672             | 5340  | 8236           | 18947            | 27183 |
| 1906-1907 | 3116                    | 22               | 1691           | 57               | 4807           | 79               | 1357           | 570              | 1927  | 3405           | 2090             | 5495  | 20240          | 10192            | 30432 |
| 1907-1908 | 4452                    | 67               | 445            | 62               | 4898           | 49               | 1926           | 111              | 2037  | 4989           | 677              | 5666  | 32242          | 1367             | 33609 |
| 1908-1909 | 4542                    | 72               | 477            | 05               | 5019           | 77               | 2031           | 125              | 2156  | 5268           | 688              | 5956  | 32568          | 1477             | 34045 |
| 1909-1910 | 4624                    | 32               | 506            | 05               | 5130           | 37               | 2174           | 131              | 2305  | 5433           | 716              | 6149  | 33665          | 1574             | 35289 |
| 1910-1911 | 4870                    | 24               | 484            | 66               | 5355           | 10               | 2231           | 130              | 2361  | 5664           | 716              | 6380  | 34750          | 1513             | 36263 |
| 1911-1912 | 5044                    | 08               | 562            | 62               | 5606           | 70               | 2305           | 162              | 2467  | 5893           | 765              | 6658  | 37952          | 1797             | 39749 |
| 1912-1913 | 5217                    | 16               | 767            | 65               | 5985           | 01               | 2381           | 197              | 2578  | 6148           | 898              | 7046  | 40527          | 2425             | 42952 |
| 1913-1914 | 5472                    | 56               | 1121           | 07               | 6596           | 63               | 2500           | 265              | 2765  | 6449           | 1092             | 7541  | 42705          | 3286             | 45991 |
| 1914-1915 | 5686                    | 26               | 1444           | 45               | 7130           | 71               | 2661           | 351              | 3012  | 6693           | 1355             | 8048  | 43702          | 3753             | 47455 |
| 1915-1916 | 5756                    | 76               | 1743           | 57               | 7500           | 53               | 2679           | 428              | 3107  | 6836           | 1511             | 8347  | 43592          | 4743             | 48355 |
| 1916-1917 | 5856                    | 64               | 1833           | 53               | 7690           | 37               | 2727           | 466              | 3193  | 6867           | 1581             | 8448  | 44391          | 4999             | 49390 |
| 1917-1918 | 5999                    | 52               | 1834           | 55               | 7834           | 27               | 2827           | 462              | 3289  | 6903           | 1595             | 8498  | 46600          | 5340             | 51940 |
| 1918-1919 | 6072                    | 74               | 1941           | 69               | 8014           | 73               | 2933           | 483              | 3416  | 7118           | 1631             | 8749  | 48568          | 5864             | 54432 |
| 1919-1920 | 6202                    | 26               | 2005           | 63               | 8208           | 09               | 3120           | 515              | 3635  | 7520           | 1782             | 9302  | 51067          | 6526             | 57593 |
| 1920-1921 | 6480                    | 79               | 1994           | 17               | 8475           | 16               | 3306           | 522              | 3828  | 8066           | 1773             | 9839  | 52199          | 6637             | 58836 |
| 1921-1922 | 6722                    | 21               | 2150           | 29               | 8872           | 50               | 3318           | 575              | 4093  | 8575           | 1955             | 10530 | 52492          | 8197             | 59689 |
| 1922-1923 | 7013                    | 33               | 2347           | 32               | 9360           | 65               | 3671           | 629              | 4300  | 9298           | 2130             | 11428 | 55405          | 7771             | 63176 |
| 1923-1924 | 7351                    | 1                | 2658           | 38               | 10009          | 39               | 3847           | 724              | 4571  | 9031           | 1767             | 10798 | 56810          | 8441             | 65251 |
| 1924-1925 | 7558                    | 72               | 2856           | 00               | 10414          | 73               | 3981           | 777              | 4758  | 9411           | 1795             | 11206 | 57882          | 9219             | 67101 |
| 1925-1926 | 7837                    | 37               | 3047           | 54               | 10885          | 11               | 3907           | 822              | 4729  | 9574           | 1794             | 11368 | 59607          | 9439             | 69046 |
| 1926-1927 | 8006                    | 18               | 3337           | 70               | 11344          | 8                | 3965           | 892              | 4857  | 9242           | 2051             | 11293 | 61897          | 10054            | 71951 |
| 1927-1928 | 8308                    | 69               | 3400           | 45               | 11709          | 34               | 4114           | 966              | 5080  | 9851           | 2969             | 12820 | 64211          | 10561            | 74772 |
| 1928-1929 | 8494                    | 63               | 3689           | 46               | 12184          | 29               | 4200           | 941              | 5141  | 10203          | 2236             | 12439 | 65896          | 10582            | 76478 |
| 1929-1930 | 8774                    | 78               | 4047           | 19               | 12822          | 17               | 4222           | 971              | 5193  | 10463          | 2386             | 12849 | 67434          | 11226            | 78660 |
| 1930-1931 | 9002                    | 34               | 4361           | 16               | 13363          | 50               | 4189           | 976              | 5165  | 10454          | 2440             | 12894 | 68353          | 11516            | 79869 |
| 1931-1932 | 9265                    | 32               | 4469           | 14               | 13734          | 46               | 4016           | 997              | 5013  | 9547           | 2509             | 12056 | 65138          | 11609            | 76744 |
| 1932-1933 | 9487                    | 09               | 4475           | 30               | 13962          | 39               | 4094           | 994              | 5088  | 9149           | 2558             | 11707 | 64923          | 11558            | 76481 |
| 1933-1934 | 9778                    | 79               | 4434           | 15               | 14213          | 13               | 4064           | 947              | 5011  | 9254           | 2476             | 11730 | 65864          | 11476            | 77476 |
| 1934-1935 | 10107                   | 79               | 4404           | 48               | 14512          | 47               | 3986           | 896              | 4882  | 9410           | 2368             | 11778 | 67485          | 11010            | 78495 |
| 1935-1936 | 10582                   | 50               | 4410           | 31               | 14993          | 01               |                |                  |       |                |                  |       |                |                  |       |
| 1936-1937 | 10826                   | 12               | 4361           | 34               | 15187          | 46               | 4235           |                  |       |                |                  |       | 73184          |                  |       |
| 1937-1938 |                         |                  |                |                  |                |                  |                |                  |       |                |                  |       |                |                  |       |
| 1938-1939 |                         |                  |                |                  |                |                  |                |                  |       |                |                  |       |                |                  |       |
| 1939-1940 |                         |                  |                |                  |                |                  |                |                  |       |                |                  |       |                |                  |       |
| 1940-1941 |                         |                  |                |                  |                |                  |                |                  |       |                |                  |       |                |                  |       |
| 1941-1942 |                         |                  |                |                  |                |                  | 5200           |                  |       |                |                  |       | 101222         |                  |       |
| 1942-1943 |                         |                  |                |                  |                |                  | 5365           |                  |       |                |                  |       | 105835         |                  |       |
| 1943-1944 |                         |                  |                |                  |                |                  | 5794           |                  |       |                |                  |       | 113497         |                  |       |
| 1944-1945 |                         |                  |                |                  |                |                  | 6236           |                  |       |                |                  |       | 120747         |                  |       |
| 1945-1946 |                         |                  |                |                  | 16930          |                  |                |                  |       |                |                  |       | 114,000        |                  |       |
| 1946-1947 |                         |                  |                |                  |                |                  |                |                  |       |                |                  |       |                |                  |       |

DATA FOR YEARS 1872-1903 TAKEN FROM "FINANCIAL AND ECONOMIC ANNUAL OF JAPAN-1903".  
 DATA FOR YEARS 1903-1913, 1913-1923, 1923-1932, 1932-1937, TAKEN FROM "FINANCIAL AND  
 ECONOMIC ANNUAL OF JAPAN" FOR YEARS 1914, 1924, 1933, 1938 RESPECTIVELY. FIGURES FOR  
 ROLLING STOCK FOR 1935-36 AND 1936-37 NOT GIVEN IN THE ABOVE SOURCES.

ABOVE FIGURES AFTER 1937 TAKEN FROM SHR-SCAP SUMMARY OF  
 NON-MILITARY ACTIVITIES IN JAPAN

ONE CHAIN = FOUR RODS = 66 FEET

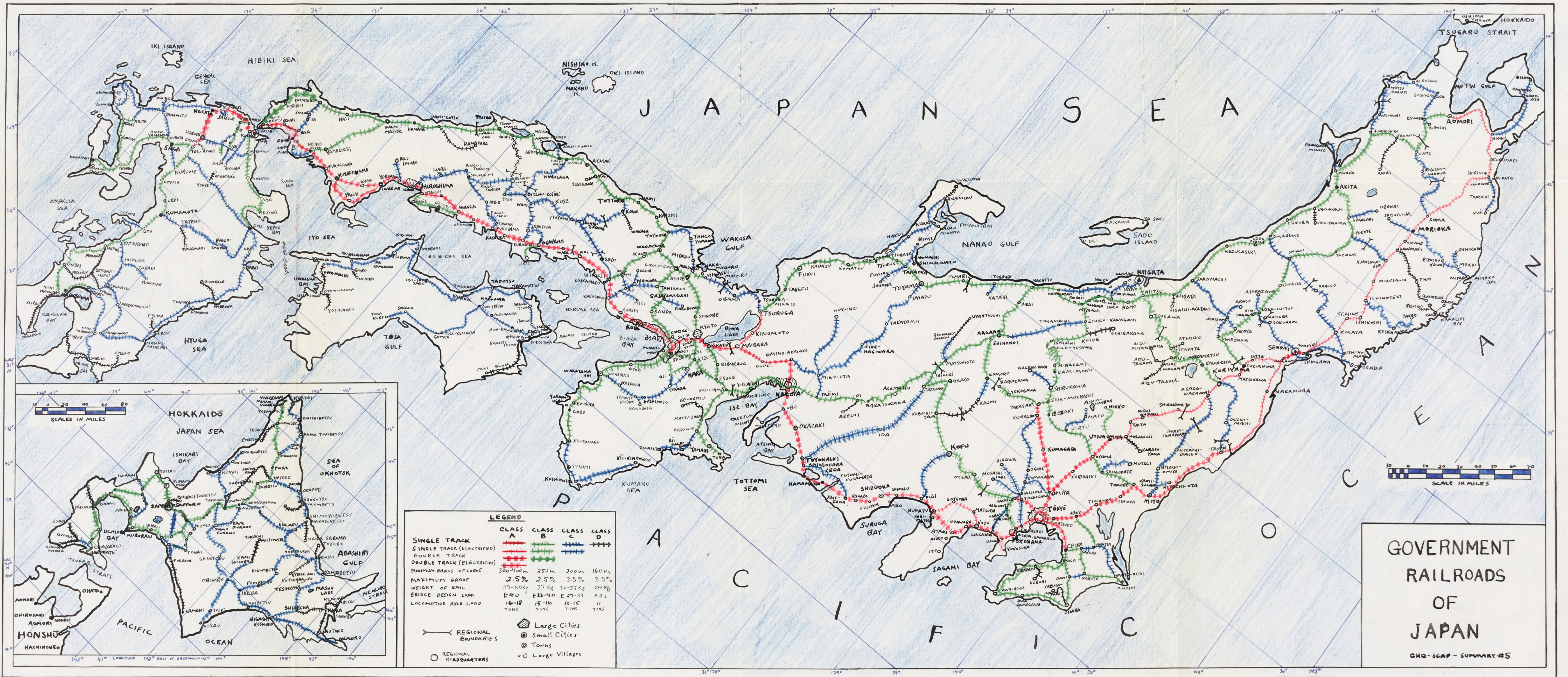
OF THE FIGURES IN THE TABLE, THOSE FOR THE YEARS PRIOR TO 1874 INCLUSIVE, REPRESENT  
 THE AMOUNTS EXISTING AT THE END OF THE RESPECTIVE CALENDAR YEARS; THE  
 FIGURES FOR THE YEAR 1875 ONLY, ARE THOSE EXISTING AT THE END OF THE FIRST  
 HALF YEAR, AND THE FIGURES FOR THE REST, THOSE EXISTING AT THE END OF THE  
 RESPECTIVE FISCAL YEARS (MARCH 31).

IN THE FIGURES FOR THE STATE RAILWAYS AT THE END OF 1906-1907 ARE INCLUDED  
 THOSE FOR THE SIX PRIVATE RAILWAYS PURCHASED BY THE GOVERNMENT IN THAT  
 FINANCIAL YEAR, WHILE THE FIGURES FOR THE YEARS SUBSEQUENT THERETO INCLUDE  
 THOSE FOR ALL THE PURCHASED RAILWAYS.

IN THE 1913-1923 FIGURES FOR PASSENGER CARRIAGES ARE INCLUDED THOSE FOR ELECTRIC  
 TRAMS AND STEAM MOTOR CARS.



MAP OF THE GOVERNMENT RAILROADS OF JAPAN



**LEGEND**

|                            | CLASS A    | CLASS B    | CLASS C    | CLASS D |
|----------------------------|------------|------------|------------|---------|
| SINGLE TRACK (ELECTRIFIED) | —+—+—+—    | —+—+—+—    | —+—+—+—    | —+—+—+— |
| DOUBLE TRACK (ELECTRIFIED) | —+—+—+—    | —+—+—+—    | —+—+—+—    | —+—+—+— |
| MINIMUM RADIUS OF CURVE    | 300-400m   | 250m       | 200m       | 160m    |
| MAXIMUM GRADE              | 2.5%       | 2.5%       | 2.5%       | 3.5%    |
| WEIGHT OF RAIL             | 37-50kg    | 37kg       | 30-37kg    | 24kg    |
| BRIDGE DESIGN LOAD         | E 40       | E 33-40    | E 27-33    | E 22    |
| LOCOMOTIVE AXLE LOAD       | 16-18 TONS | 15-16 TONS | 13-15 TONS | 11 TONS |

— REGIONAL BOUNDARIES  
 ○ REGIONAL HEADQUARTERS  
 ● Large Cities  
 ○ Small Cities  
 ● Towns  
 ○ Large Villages

**GOVERNMENT RAILROADS OF JAPAN**  
 GHC-SCAP - SUMMARY #5

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