

Chap. 4 : developing an independent
transportation technology (1910-1921) :
coastal and river transport

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amount of taxes paid and the capital sources that the operator had available, requiring certain standards in order to be certified by the Railway Agency as a freight handler. Improvements included the posting of the names of freight handlers and of their business at depots and the provision of special privileges, such as the right to pay railroad fares at a later date. This intervention by the railroads in the railroad freight-handling business was only half-hearted, for it still allowed non-certified operators to continue in business. But beginning in 1920, the worsening economic recession called for policies geared toward greater efficiency, for improvements in the ability to pick up and deliver freight, and for reductions in cost. The intervention of the railroad authorities gradually grew stricter. By the end of February 1921, 5,187, or about five-eighths of all freight handlers, were certified.⁶

Notes

1. Nihon Noriai Jidosha Kyokai, *Basu jigyō goju-nen shi* (Fifty-year history of the bus industry) (Nihon Noriai Jidosha Kyokai, 1957).
2. Yanagida Ryozo, *Jidōsha sanjū-nen shi* (Thirty-year history of motor vehicles) (Sansui Sha, 1944).
3. Kanagawa Prefecture, ed., *Taishō kyūnen Kanagawa-ken tōkei sho* (1920 statistics for Kanagawa Prefecture); idem, *Taishō jūgonen Kanagawa-ken tōkei sho* (1926 statistics for Kanagawa Prefecture); *Kanagawa-ken Koho* (Official report on Kanagawa Prefecture), no. 1287 (25 August 1925); Nihon Doro Kyokai, *Nihon dōro shi* (History of Japanese roads) (Nihon Doro Kyokai, 1977).
4. Railway Ministry, Bureau of Transport, *Kokuyū Tetsudō no kounsō mondai* (Problems in small-scale transport on the National Railways) (Railway Ministry, Bureau of Transport, 1935).
5. *Ibid.*, *Tōkyō-shi oyobi sono fukin ni okeru kounsō no genjō* (The situation in small-scale transport in the city of Tokyo and its environs) (Railway Ministry, Bureau of Transport, 1924).
6. *Kokuyū Tetsudō no kounsō mondai*.

Coastal and River Transport

Hiromi Masuda

Effects of the First World War

The shipping industry recovered in the first half of 1910 from the recession caused by the post-Russo-Japanese-War excess in number of ships. It also increased its speculative imports of foreign ships because of the government's decision to revise tariffs, beginning in July 1911, which would lead to an increase in taxes on old ships. The number of ships built also increased, a reflection of the favourable conditions in the world shipping market. At the end of 1913, the year before the First World War broke out,

Japanese shipowners had in total 3,286 steamships (1,528,000 tons) and 13,169 sailing-ships (570,000 tons).

Japan declared war on the Central Powers in 1914 and began an assault on the German garrison at Qingdao. The army and navy commandeered 83 steamships (265,000 tons) for the campaign, but the greater number of registered ships in operation at this time prevented the commandeering from having any large impact on the industry as it did during the Sino- and Russo-Japanese wars. Moreover, the German U-boats wrought horrendous damage on Allied shipping, with about 30 per cent destroyed by the end of 1917, resulting in a world shortage of bottoms. This made freight- and charter-ship fares soar, which was an unprecedented shot in the arm to the Japanese shipping industry and led to an increase in the number of ships being built. Due to this dramatic war-induced leap, Japan jumped from the world's sixth largest owner of ships in 1905 to third, after the United Kingdom and the United States, in 1919. A more detailed discussion on the situation follows.

To compare cargo tonnage in inland shipping, we take 1913, the year before the outbreak of the First World War, as 100. Tonnage for 1914 dropped to 94, for 1915 to 86, and for 1916 to 93, negative figures of -7 to -14. The numbers then begin to rise gradually, with 1917 at 102, 1919 at 109, and 1921 at 102. However, when these figures are compared with those for cargo charges, the only minus number is the 95 (-5) for 1915; after that, prices soar to a high of 389 in 1919. This is the result of the increase in freight charges. The cost to customers to ship a ton of coal between Kyushu

Table 7. Number of inland steamships and sailing-ships (1910-1921)

Year	Steamships		Sailing-ships	
	Number	Tonnage	Number	Tonnage
1910	2,545	1,233,909	6,392	413,720
1911	2,844	1,386,534	8,192	451,520
1912	3,064	1,442,884	10,601	500,042
1913	3,286	1,528,264	13,169	570,319
1914	3,487	1,593,404	14,552	609,160
1915	3,636	1,623,091	17,498	671,273
1916	3,882	1,717,724	20,602	745,451
1917	4,042	1,849,903	24,136	896,060
1918	4,775	2,337,679	28,702	1,092,407
1919	5,203	2,869,688	31,983	1,208,190
1920	5,810	3,047,498	34,821	1,272,985
1921	6,113	3,207,457	35,685	1,292,016

Source: *Nihon keizai tōkei sōkan* (Complete statistics on the Japanese economy), pp. 835-836.

Table 8. Volume and increase or decrease of internal shipping (1913–1921)

Year	Tonnage (in 1,000s)	Index
1913	30,268	100.0
1914	28,389	93.8
1915	26,088	86.2
1916	28,246	93.3
1917	30,832	101.9
1918	30,675	101.3
1919	33,096	109.3
1920	32,467	107.3
1921	30,829	101.9

Source: *Nihon yusō shi* (History of Japanese transport) (Nihon Hyoron Sha, 1971), p. 421.

and Yokohama, as one example, was ¥1.25 yen in 1914, but by 1919, it had climbed to ¥11. Increased freight costs also brought about an increase in the costs to charter vessels; the cost to charter a large scheduled ship was ¥1.75 per ton in 1914, and the charge had soared to as high as ¥50 in 1918.¹ The number of shipyards reflected the good shape of the economy, increasing from 238 in 1914 to 371 in 1918; annual construction grew from 50,000–80,000 tons (steamships) in 1913–1914 to more than 634,000 tons by 1919, and from 30,000–40,000 tons (sailing-ships) to 162,000 tons in 1918. Ship exports also rose, from an annual 5,000 tons to a high of 241,000 tons in 1920. Japan had the world's third-highest registered ship tonnage in 1919, after Great Britain and the United States, with 5,203 steamships (2,870,000 tons) and 32,000 sailing-ships (1,208,000 tons); in 1921 there were 6,113 steamships (3,200,000 tons) and 35,700 sailing-ships (1,290,000 tons).

The First World War boom brought brisk activity to the shipping industry. But when the war ended in 1918, the North American and European countries turned their attention to rebuilding their own trade and shipping industries, the good times turned to bad, more and more ships were tied to their moorings, and there was a particularly pronounced move of larger ships into coastal and inland shipping that tightened the screws on the smaller ships. All of this brought on a drop in fares and charter rates. Fares for scheduled charter of large ships, for example, went from ¥30–¥50 per ton in 1918 to ¥14 in 1919, dropped sharply to ¥5 in 1920, to ¥2.50 in 1923, and finally to ¥1.80 in 1926 – a drop all the way back to the 1914 levels.²

Increase and Qualitative Change in Inland Cargo Shipping

Cargo volume in inland shipping dropped for a while after the war started, and subsequent increases were not as great as in ocean-going shipping, the 1919 volume being 1.1 times the 1913 level. In the postwar recession that

Table 9. Number of ships newly constructed and exported/imported (1910-1922)

Year	Number of shipyards	New construction										Imported steamships		Exported steamships	
		Steamships		Sailing-ships		Number	Tonnage	Number	Tonnage	Number	Tonnage	Number	Tonnage	Number	Tonnage
		Number	Tonnage	Number	Tonnage										
1910	230	77	24,479	147	11,097	20	40,268								
1911	216	142	41,229	216	13,132	49	29,454								
1912	228	168	48,155	372	23,899	24	49,019								
1913	230	115	51,525	659	43,598	27	55,120				1	22			
1914	238	79	82,873	557	34,528	13	32,182				3	687			
1915	209	63	51,431	441	26,024	11	35,081				17	5,771			
1916	219	91	144,024	519	45,831	11	32,065				12	11,762			
1917	335	244	263,820	1,354	126,773	13	7,280				96	55,795			
1918	371	443	540,531	1,804	161,964	20	3,632				18	73,586			
1919	362	270	634,220	1,325	91,223	15	947				16	41,964			
1920	350	145	448,326	52	7,420	6	20,544				71	241,284			
1921	360	69	226,081	12	1,711	4	2,883				19	29,379			
1922	342	57	71,076	14	2,167	22	57,911				8	12,939			

Source: *Nihon keizai tōkei sōkan* (Complete statistics on the Japanese economy), p. 837, "Table of Ships Newly Built and Imported."

restored equilibrium after the wartime boom, cargo volume dropped, but not below the 1913 level, then immediately bounded back to a 1922 level that was 1.14 times and a 1927 level that was 1.52 times that for 1913 (see table 8 and chap. 5, table 9). The structure of inland shipping during this period can be grasped from the following statistics for 19 major ports handling 70 per cent of the nation's inland cargo. The overwhelmingly largest cargo category for 1916 was fuel at 43.3 per cent (coal 42.8 per cent and oil 0.4 per cent); in second place was food at 7.8 per cent (rice 4 per cent, sugar 2.1 per cent, salt 1.2 per cent, and sake 0.6 per cent); in third place was construction materials at 5.4 per cent (lumber 4.8 per cent and cement 0.5 per cent); in fourth place, metals at 3.9 per cent (iron and steel products 3.8 per cent and copper 0.1 per cent); and in fifth place was fertilizer at 3.3 per cent. For 1925, fuel is still in first place at 40 per cent but with a slight drop in coal and a slight increase in oil (coal 39.3 per cent and oil 0.8 per cent); in second place was construction materials at 13.4 per cent (lumber 7.6 per cent, cement 2.6 per cent, and sand and gravel at 3.1 per cent); in third place was food at 8 per cent (rice 3.9 per cent, sugar 2.7 per cent, salt 0.9 per cent, and sake 0.6 per cent); in fourth place, metals at 6.1 per cent (iron and steel products 5.6 per cent and copper 0.6 per cent); and in fifth place was fertilizer at 3.2 per cent. We can see in these figures how important domestic economic development was becoming, particularly centring on the heavy industries.

Turning to inland cargo shipping trends, Osaka and Yokohama were the two largest ports in the nation, with little difference between them in cargo quantity moved in and out. But, in 1922, Yokohama began a rapid increase in cargo volume, and when we compare the two ports in terms of cargo value, we see big differences. And, in contrast to the increase in cargo volume at Yokohama, there is a rapid decline in value of goods that begins in 1922. I believe that one of the reasons for this is that the Osaka region was supported by light industry and consumer goods, particularly the textile industries, while Yokohama was supported by the heavy industry of the Keihin area. Yokohama was undergoing a qualitative change and 1922 marks the point of that change in which it was moving from an era of high value to one of handling a large volume of goods. Thus, after the Great Kanto Earthquake, Kobe entered the export market for silk and broke Yokohama's monopoly on that commodity, a fact reflecting the type of industrial development that was occurring in the Keihin area.³

The Development of Shipbuilding Technology and Transport Methods

Very important things were happening in ocean transport methods and technology during this period. For one, a foundation was being laid for a modern shipbuilding industry that not only quantitatively improved Japan's international position, making it the third-largest shipbuilder in the world and a ship-exporting country, but also improved the quality of ships. Jap-

Table 10. Volume of inland shipping cargo by type (1916-1935)

Type	Item	Quantity (absolute figures)				Quantity (percentage)				
		1916	1925	1935	1916	1925	1935	1916	1925	1935
Foodstuffs	Rice	1,666	2,043	3,234	3.98	3.90	3.14	3.98	3.90	3.14
	Sugar	883	1,407	1,754	2.11	2.67	1.70	2.11	2.67	1.70
	Salt	479	450	1,606	1.15	0.86	1.56	1.15	0.86	1.56
	Sake	236	310	456	0.56	0.59	0.44	0.56	0.59	0.44
	Subtotal	3,264	4,210	7,050	7.81	8.04	6.86	7.81	8.04	6.86
Textiles	Woven cloth	138	338	593	0.33	0.65	0.58	0.33	0.65	0.58
	Cotton thread	196	191	251	0.47	0.37	0.24	0.47	0.37	0.24
	Cotton cloth	40	86	61	0.10	0.16	0.06	0.10	0.16	0.06
	Raw cotton	451	274	570	1.08	0.52	0.55	1.08	0.52	0.55
	Subtotal	825	889	1,475	1.97	1.70	1.43	1.97	1.70	1.43
Fuel	Coal (coke)	17,916	20,583	32,288	42.84	39.30	31.34	42.84	39.30	31.34
	Oil	174	396	2,724	0.42	0.76	2.64	0.42	0.76	2.64
	Subtotal	18,090	20,979	35,012	43.26	40.05	33.99	43.26	40.05	33.99
Construction materials	Lumber	2,023	3,985	5,122	4.84	7.61	4.97	4.84	7.61	4.97
	Cement	226	1,383	3,391	0.54	2.64	3.29	0.54	2.64	3.29
	Sand and gravel	—	1,637	5,173	—	3.13	5.02	—	3.13	5.02
	Subtotal	2,249	7,007	13,686	5.38	13.38	13.29	5.38	13.38	13.29

Table 10 (continued)

Type	Item	Quantity (absolute figures)			Quantity (percentage)		
		1916	1925	1935	1916	1925	1935
Metals	Iron	737	1,082	2,936	1.76	2.07	2.85
	Pig-iron	141	129	1,342	0.34	0.25	1.33
	Steel	162	1,116	4,327	0.39	2.13	4.20
	Iron products	334	334	1,513	1.35	0.64	1.47
	Other iron products	566	254				
	Subtotal	1,606	2,915	10,118	3.84	5.57	9.82
	Copper	38	287	347	0.09	0.55	0.34
	Metals subtotal	1,644	3,202	10,465	3.93	6.11	10.16
Fertilizers	Fish cake	440	607	314	1.05	1.16	0.31
	Herring	38	2	68	0.09	0.04	0.07
	Soya bean scrap	271	375	399	0.65	0.72	0.39
	Manure	614	694	2,852	1.47	1.33	2.77
		Subtotal	1,363	1,678	3,633	3.26	3.20
Pulp	Paper	298	444	1,116	0.71	0.85	1.08
	Pulp, etc.	95	156	422	0.23	0.30	0.41
	Subtotal	393	600	1,538	0.94	1.15	1.49

Chemical products									
Soda ash	16	13	51	0.04	0.03	0.05			
Caustic soda	30	12	39	0.07	0.02	0.04			
Sulphuric acid	46	25	96	0.11	0.05	0.01			
Subtotal	200	637	2,876	0.48	1.22	2.79			
Ore	13,743	13,151	27,186	32.86	25.10	26.39			
Miscellaneous	41,817	52,378	103,017	100.00	100.00	100.00			
Total for the 19 ports	(70.56)	(68.37)	(57.84)						
National total	59,268	76,615	178,121						
	(100.00)	(100.00)	(100.00)						

Source: *Nihon yusō shi* (History of Japanese transport), p. 417, table 30.

Note: Total inflow and outflow of cargo for the 19 ports of Otaru, Hakodate, Muroran, Aomori, Tokyo, Yokohama, Niigata, Fushiki, Nagoya, Osaka, Kobe, Amagasaki, Onomichi, Shimonoseki, Takamatsu, Moji, Wakamatsu, Nagasaki, Kagoshima.

anese-style sailing-ships, the so-called *koku* ships, continued to decrease in number from around 1910 on as inland shipping shifted over to Western-style sailing-ships. By 1925 there were 5,608 *koku* ships, for a total weight of 735,000 *koku* (taking 10 *koku* as equal to 1 ton, for a total of 73,500 tons), a decline to one-fourth or one-sixth as much tonnage as there had been in the first years of Meiji. In 1915, the number of Western-style sailing-ships exceeded that of Japanese-style sailing-ships, and by 1921 there were 35,685 ships (1,292,016 tons). Western-style sailing-ships continued to increase gradually in terms of number, but 1921 marked the peak for tonnage, with a subsequent gradual decline.⁴ This is why unregistered ships of 20 tons or less increased but registered ships, especially the 100–500 ton class, declined.⁵ The change-over from Japanese-style to Western-style sailing-ships beginning in this period, the chief development in inland shipping, the change from sail power to steam power, and the selling and scrapping of old ships were some of the measures that were taken to cope with recession.

We can see this trend with steamships too. During the postwar recession, steamships increased in both tonnage and number, but the 100–200 ton class peaked at 609 ships in 1920 and remained at around 590 after 1921. The 500–1,000 ton class peaked at 372 in 1919 and then gradually decreased. These two were exceptions, because unregistered ships in the 20 ton and under and the 1,000 ton+ class increased.⁶ This shows that steamships were able to cope with recession, at least the small, fast, manoeuvrable types used in inland shipping and the large, swift ocean-going ships with their large transport capabilities.

Dramatic progress in shipbuilding capability and greater efforts to create the technologies for building more economical ships supported this tendency of two extremes in ship size. Two ways in which this was manifested were through the development of a practical diesel engine and the equipping of sailing-ships with engines. Small, high-output diesel engines were powering naval submarines before World War I. After the war, studies were made on how these engines could be commercially used. They were eventually installed in surface ships in 1923, in Japan's first diesel-powered ship, the 688-ton *Ondo Maru*. In addition, Japan developed auxiliary engines for use in sailing-ships, with the first installation in 1900. By 1910, 80 ships (4,000 tons) had engines and by 1921, 1,162 ships (72,000 tons), or 8 per cent of the 20-ton and larger Western-style sailing-ships, were equipped with engines. This dramatic increase continued for some time afterwards.

Progress in shipbuilding technology aided the shipping industry by helping it to get out of the difficulties it had fallen into due to the postwar financial collapse. However, we cannot ignore the great deal of help the industry received from administration policies on shipbuilding, ports, and harbours. To hold down some of the activity in the shipbuilding industry, which was in high gear dealing with a world shortage of ships, the government suspended in 1917 the subsidies in place since 1896 by virtue of the Law on Incentives for Shipbuilding. In their place, in 1918 the government revised the Japan Industrial Banking Law and began financing shipping itself. To deal with

the postwar recession, the government tried to help the shipbuilding industry by its policies of strengthening the navy. However, the Washington Conference on disarmament made that policy unworkable, and the government then devised protectionist means by which to help domestic shipbuilding. In 1921, it amended the Law on Fixed Tariff Rates to exclude from import duties ship fittings and steel used in shipbuilding, and in 1925, it amended the Law on Steel Industry Incentives to provide subsidies that would encourage the production of steel for shipbuilding. Further amendments were made to the Law on Fixed Tariff Rates in order to raise the duties on ships purchased abroad.

In 1918, the Home Ministry decided to consolidate all policies related to ports and harbours to deal with the increased construction. The way was opened in 1920 to transfer national assets created by constructing ports and harbours to outlying areas, and in 1921 the Law on Landfill in Public Waters was enacted to provide legal grounds for using landfill to construct and maintain ports and harbours. It should be mentioned that the Canal Law of 1913 gave legal foundation to the construction of canals as part of the construction or maintenance of ports and harbours. Some of the most important landfill projects during this period were for the port of Kawasaki and at the digging of the Keihin Canal in 1913. The wartime economy gave impetus to construction and maintenance at the ports of Niigata, Muroran, Otaru, Nagoya, Shimonoseki, Kagoshima, and Fushiki and allowed construction to be completed on the great pier at the port of Yokohama in 1917.⁷

The Development of River Transport in the Cities

After the first flood-control construction project on the Yodo River in 1899, similar projects were implemented throughout the nation, one of the largest being along the Tone River. Flood-control construction made it more difficult for boat transport on the rivers, but this was not the direct cause that brought river transport to an end. In 1911, Naikoku Tsuun consolidated close to 20 Tone River boat routes that were unprofitable and reformed boat management on the remaining 11. However, the company eventually got out of the river-boat business in 1919 by selling the steamships it had operated for many years.⁸ The situation can be better grasped if we take a look at the number of ships and cargo volume that passed through the canals on the Tone River.⁹ The routes were opened during 1890, so figures for the first full year are for 1891. In that year, there were 29,696 vessels (554,613 tons); in 1896–1897 there was a slight tonnage increase but a drop in the number of vessels. In 1901, there were 23,082 vessels at 474,481 tons; the figure decreases in 1911 to 20,676 vessels at 433,948 tons; and in 1921, drops again to 11,932 vessels at 260,051 tons. The drop from 1911 to 1921 was especially sharp. In those 10 years, the number of ships was halved, and this declining trend continued until 1931.

We can see the sharpness of the cargo decline on Tone River boats from 1911 to 1921 by comparing it to the increase in cargo during the decade of

dramatic economic development that centred on the First World War. Thus, according to the 1920 Tokyo Port Construction Plan,¹⁰ in reference to the total cargo tonnage handled in Tokyo for this period, if 100 is taken as the index for 1908, for 1917 the figures become 356 for land transport, 146 for water transport, with the average coming out at 251.

Inland water transport can be broken down into four parts: (1) the loading and unloading of Tokyo-related cargo at Yokohama Port; (2) the loading and unloading of cargo offshore from Shinagawa; (3) the loading and unloading of inland river cargo upon entering the Sumida River; and (4) cargo handling transacted on rivers within the cities along the Onagi and other tributary rivers. Thus, the cargo that goes through the canals on the Tone River is in category 4. Despite an obvious decrease in category 4, the overall increase in water transport is, of course, attributable to the increase in inland shipping. Another thing that is important here is that, although the amount of cargo carried by ships along the Tone River declined, rivers within cities became increasingly important in inland shipping for the delivery of cargo, and the relative importance of transport boats in their traditional role as barges increased.

A 1913 survey on the Tokyo coal market reports on the transport of freight to Tokyo as follows.¹¹ The annual input and outgo of cargo by water and land was 9,790,000 tons – 4,760,000 tons carried on water and 5,030,000 tons by train. Of the amount carried by train, 2,480,000 tons was transported into the city by river boat. Thus, 74 per cent of the cargo going into and out of Tokyo was carried on the rivers. These figures indicate that no matter whether eventual transport was by ocean or land (railroad), most cargo at the time had to go in and out of Tokyo by river boat. It also shows that river-boat transport in the city was more important than earlier, a fact attributable to the vast expansion of the urban area. But from the standpoint of economy, we see how uneconomical the operation of barges was and how their use in cargo loading and unloading at Yokohama impeded economic progress. This lack of economy in the use of barges was the biggest reason for the reconstruction of the port of Tokyo beginning in 1885.

Although the uneconomicalness in shipping by barge is seen in its most acute form in Tokyo, it was also a problem in Osaka and the country's other ports. Preparations to modify the ports began during this period, along with the increase in the amount of cargo handled, because it was realized that the most economical means of transport would be those that would eliminate the barges and directly connect ocean (or river boat) to land transportation. The dredging of harbours made it possible for large ships to dock, and the construction of tracks right up to the docks completed the connection between ocean and land transport. To make cargo loading at the ports more efficient, canals were dug and derricks and cranes installed for loading and unloading. This advanced even further Japan Railway's connection between railroad and barge (urban river boat) at the Akihabara and Sumidagawa stations.

Nagoya is an early example of railroad track construction to connect with

a port facility during the modernizing and repairing of ports and harbours. The second period of construction at Nagoya Port was from 1911 to 1919 with the digging of the Horikawa and Shinhorikawa canals. This construction connected the commercial and industrial areas of the city with the port. There were two lines near the port, one between Nagoya and the port of Nagoya that had started operating in 1912 and another, established in 1916, that branched off from the first and moved along the Shinhorikawa Canal to Yawata and Shiratori stations. Horikawaguchi Station, which was on the new line that extended from the port of Nagoya to the mouth of the Horikawa Canal, was opened in 1928.¹²

Yokohama started its third period of construction for expansion in 1921, the construction proceeding with various changes in plans. These changes made for a complex pattern of development in the line running along the harbour coast. The amount of cargo handled at Takashima Station, on a line branching off from Yokohama Station, increased because this station was at the centre of the region adjacent to the port. But this increase abated with the opening in 1924 of Higashi Takashima Station between Takashima and Higashi Kanagawa stations.¹³

The modernization of ports and adjacent lines progresses even further in the next period.

Notes

1. *Nihon keizai tōkei sōkan* (Complete statistics on the Japanese economy) (Asahi Shinbun Sha, 1930), p. 801.
2. *Ibid.*, p. 802.
3. *Nihon yusō shi* (History of Japanese transport) (Nihon Hyoron Sha, 1971), p. 421.
4. *Ibid.*, pp. 428–429.
5. *Nihon keizai tōkei sōkan*, p. 836, "Table of Tonnage of Inland Sailing-ships."
6. *Ibid.*, p. 835, "Table of Tonnage of Inland Steamships."
7. *Naimushō shi* (History of the Home Ministry), vol. 3, p. 86.
8. Matsumura An'ichi, "Tonegawa kisen kōtsū no hensen" (Changes in steamboat transport on the Tone River), *Kotsu Shi Kenkyū* (Historical review of transport and communications), no. 7, pp. 13–14.
9. Kawana Haruo, *Tone Unga shi* (An account of Tone Canal) (Ronshobo, 1971), pp. 82–88.
10. *Tōkyō-shi shikō* (Historical materials for the city of Tokyo), "Ports and Harbours," vol. 5 (Tokyo Metropolitan Office, January 1927), p. 857.
11. "Tōkyō ni okeru sekitan shijō gaiyō" (General description of the coal market in Tokyo), *Nihon sangyō shiryō taikai* (Encyclopaedia of data on Japanese industry), vol. 5, "Industry," p. 396.
12. *Nihon Kokuyū Tetsudō hyaku-nen shi* (Hundred-year history of the Japan National Railways), vol. 9, p. 253.
13. *Ibid.*, p. 252.