

# The Time Revolution of the Railways in the 1920s: The Impact of the Changeover to Automatic Couplers

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## 1 THE ROAD TO ON-SCHEDULE OPERATION

It is not only railway enthusiasts who think immediately of “time management to the minute according to a fixed schedule” when talking about Japanese railroads. From the Nozomi, which as a matter of course runs jauntily down the New Tōkaidō Line at hyper speeds, to the Sonic, the JR Kyushu 883 Type limited express train, Japanese railroads maintain on-schedule train operation. Nearly everyone recognizes that the railroads in England, the country that pioneered railroads for the rest of the world, and in other European countries are not up to Japanese standards of time management. It can be said that with respect to on-schedule train operation, Japan surpasses its mentor country, England. But there is an important historical fact we should note here: on-schedule operation of Japanese railroads was not realized instantaneously in 1872, with the opening of rail service between Shinbashi and Yokohama. Time management to the minute according to a fixed schedule is an issue that has come up repeatedly during the long history of Japanese railroads.

On the inability of Japanese railroads to maintain on-schedule operation during their formative period, I yield to the authority of *Nihon tetsudōgyō no keisei*: 1869-1894 (Nihon Keizai Hyōronsha, 1998) by Nakamura Naofumi 中村尚史. Nakamura describes how on-schedule time operation was not achieved, despite *Tetsudōryō* (The Japanese Government Railway) *Train Transportation Rules*, and he explains the problems. We need not recapitulate his research here. Rather, let us inquire when and in what circumstances Japanese railroads realized time management to the minute according to a fixed schedule. I will take a typical historian’s approach, presenting documents written about railroads and seeking to discover clues to the problems. Let us first look at Ōwada Tateki’s “Train Trip” (“Kisha ryokō”)<sup>1</sup>, written in 1895:

“A few days after the opening, on 5 April,” Ōwada wrote, referring to the Fourth Domestic Industry Encouragement Exhibition in Kyoto, “I finally left Shinbashi by train at 11:45 a.m.” He reported that he got off at Hamamatsu Station and stayed in Hamamatsu, waiting for the down train that was to depart there at 6:00 the following

morning. “I waited and waited, but the train didn’t come. This was the train that left Shinbashi at 9:55 the night before. Though I had thought that there would be fewer people taking a night train, it was said that there were actually more people getting on the train at each station. I endured the wait, but the crowds were even greater than the day before.” In the end, the train “arrived two hours late because of the extreme confusion caused by the huge load of passengers who boarded the train along the way.”

Ōwada describes vividly, in a manner typical of a man of letters, a train that arrived at its destination station in Kyoto two hours late. The point to which I want to draw attention is that at that time it was customary for wealthy passengers traveling from Tokyo to Kansai to get off on the way in order to avoid night trains and to stay one night around Hamamatsu. Incidentally, these delays that Ōwada encountered occurred at the most crowded time for railroads, the beginning of the exhibition season. Therefore, we probably should not draw conclusions about the disarray of the train timetable based on this document. Next, let us look at some examples of train travel on the first day of the new year, when there were the fewest long distance travellers:

January first of Meiji 32 (1899) has at last come. . . . Thinking of getting on the up train at 5:10, I came to Tsuyama Station after 4:00. There were many people, Japanese and foreigners, in the switchyard. Farmers from nearby came and killed some time, as trains are a novelty. Five o’clock came, but the train failed to arrive. At 6:00 it still hadn’t come. I asked the clerks, and others, but they didn’t know either. The loiterers were all gone and the busy ones were all asking for their fares back, so it was a crowded scene. . . . I had a rest and a little drink in a seedy inn, and finally at 10:15 the train managed to depart. I asked why such a delay had occurred and they said it was because the train from Okayama, which had been supposed to arrive in Tsuyama at 4:00, had halted operation due to damage to the locomotive at Tamakasu, and that the company had three locomotives and thirty coaches, so there had not been enough cars at Tsuyama on that day to allow an unscheduled train to depart, and furthermore, they had not found out about it in time, etc. I heard that the No. 4 locomotive, which had again been damaged at that time, went out of operation the other day.<sup>2</sup>

The passage above is an example of train delays during travel between Tsuyama and Osaka. Railroads at the end of the nineteenth century were objects of admiration for farmers, who thought them high-class and were enchanted to an extent unimaginable now. In that Japan of bygone days, the railroads were a force for conveying culture and information to remote regions. This passage causes me to reflect deeply again on how distant the Meiji era is from us today. The delays of trains mentioned above are examples from branch lines. What about the most important trunk line, the express trains of the Tōkaidō Main Line, the section from Shinbashi to Kobe that opened on 1 July 1889? I offer two examples of express train delays in 1905 and 1907 from *Tetsudō jihō*.

When the Kobe express train, which left Shinbashi at 6:00 p.m. on the 12th past, arrived at Kokufutsu Station at 7:50 on the same evening, it was discovered that the rear wheel of the bogie brake van that was connected was extremely hot, and so they immediately made quick repairs. We left there twenty-three minutes late. However, these cooling repairs were again performed at each station on the way, such as at Horinouchi, and at Hamamatsu as well, and gradually the train became delayed. The train arrived at Nagoya Station at 5:00 the next morning—that is, it was delayed about an hour-and-a-half. They said the up train had also been somewhat affected by an accident.<sup>3</sup>

On the way from Kyoto, I boarded the express train for Himeji departing at 4:50. . . This train runs to Osaka nonstop. This time, however, as the preceding train unfortunately arrived at the station very late and left very late, the train on which I was riding finally caught up with it. And as the train ahead of us was not an express, it stopped at every station, and thus the express train I on which was riding, which was not supposed to stop, had no recourse but to stop. Not only that, but what was really awful was that the train did things that might have been seen on Japanese railroads almost ten years ago, such as stopping not at the station, but in the middle of a field, whenever there was some trace of another train ahead.<sup>4</sup>

The Tōkaidō Main Line at the beginning of the twentieth century was a single track. As the two examples just cited reveal, that must have been a major reason for train delays. Thus even express trains were often delayed. (The double tracking of all sections of the Tōkaidō Main Line was completed in 1913; 1926 for the San'yō Main Line). I should add that, although I've spotlighted the problem of train delays, the most important key to on-schedule operation was prevention of early departures. In *Tetsudōryō Train Transportation Rules*, No. 46, mentioned earlier, the early departure of trains was clearly prohibited:

The primary duty of station workers is to be mindful of arrivals, switching and departures of trains. . . . Never depart earlier than the scheduled time inscribed on the timetables.<sup>5</sup>

For railroads, strict observance of operations manuals is always the core of time management. The realization of early departure prevention, expressly provided for in the operations manual, was critical to the establishment of service discipline. However, though the manuals lay out the standards set by the railroad authorities, they are at great variance from actual train operation. Let us observe this point in *Tetsudō jihā*.

Three minutes of delay in the departure from Shinjuku Station were recovered between Ōkubo and Nakano; however, at the time of arrival at Nakano Station,

since the place where the train stopped was incorrect and the last six cars were off the platform, it was judged very dangerous for the passengers to get off. . . . We departed from Ogikubo Station on time. However, neither at this station nor at other stations was the custom observed upon departure of seeing trains off with careful observation. At Kichijōji Station this careful observation seemed to be performed but we can only judge that allowing the train to depart a minute early was improper (however, I had a watch that I had synchronized with the news at noon on that day and had nevertheless checked with the watch of the conductor at the rear section of the train concerned, for confirmation—and my watch was one minute behind his—so the above-mentioned minute early departure is based on a calculation based on the watch of the conductor). . . . At Sakai Station the train again left one minute early. At Kokubunji Station it departed two minutes early, and at Tachikawa, Hino and Toyota Stations it departed about three minutes early, arriving at Hachiōji more than three minutes early.<sup>6</sup>

From the above, it is clear that there were many actions seen one after another in breach of *Transportation Rules*. For example, platform personnel omitted the acts of standing at attention, watching carefully, and seeing off that should have all been performed as a matter of course by the stationmasters of each station when trains were received and sent off, and neither station staff nor conductors showed any concern about the early departure of trains. The writer sternly warns about this point, saying:

A stationmaster's standing and watching closely at the time of train arrivals and departures is equivalent to bowing to demonstrate mutual concern when welcoming and seeing off individuals, and if he neglects to do so he should not be exempted from being called rude. Moreover, the final observation by the stationmaster when a train starts out gives him the chance to discover such things as coupler (side chain) defects or neglected car door latching, and can often prevent dangers that might lie ahead. . . . Concerning the early departure of trains, there are express provisions in Article 25 of *Transportation Rules*. The rules state that trains must never depart before the time indicated on the displayed timetables. Keeping time is one of the three biggest requirements, along with public safety and convenience; moreover, these other two requirements are often related to the question of whether or not the schedule is followed. Therefore, when time is lost, whether it be by delay or early departure, it causes damage as a matter of course. To be sure, in actuality we cannot compel cessation of delays in the operation of trains simply with prohibition orders. However, with regard to early departure, we ought to be able to prohibit and extirpate it. If it is not prohibited, it will sometimes cause people who come to the station on time, according to the schedule, to miss their opportunity to board trains (an opportunity that fits into the category of public rights). This is why this provision exists.<sup>7</sup>

To repeat, time management to the minute according to a fixed schedule was the objective of the railroad authorities. However, concerning the most important thing, actual train operation, it seems that in Japan discipline had been fairly lax since the days of railroad founding. Of course we cannot generalize on the basis of the examples of the Kōbu Line Railroad On-site Operation Section alone, but as we have seen, on-schedule operation was an extremely difficult problem regardless of whether the country was advanced or developing.

Another perspective on the problem of on-schedule train operation is to be found in literary works. As is well known, among the authors in Japan's modern era, Natsume Sōseki demonstrated a particularly keen interest in railroads:

Nothing so much as the train represents twentieth-century civilization. It puts hundreds of people into a box and zooms past. It is relentless. . . . Nothing despises individuality so much as the train. Civilization adopts every possible means to develop individual character and then tries to stomp on this individual character by every means possible. . . . Every time I see a train running fiercely and indiscriminately, regarding all people as equivalent to freight, I compare the individuals impounded in the passenger coaches to the train, running without paying even the slightest heed to the individual characters of the people, and I feel it is dangerous, dangerous. The odor of this danger thoroughly permeates modern civilization. The train, moving blindly forward as if seeing in total darkness, is one specimen of this danger.<sup>8</sup>

This is from *Kusamakura*, in which Sōseki describes in detail, with a fine interpretation of the train as a tool of civilization, the loss of individual character in the information space of the modern era. His novella *Sanshirō*, serialized in the *Asahi Shinbun* from 1 September to 29 December 1908, opens with a description of a scene inside a train. A train that Sanshirō boards at Shimonoseki Station on his way to Tokyo runs up the San'yō and Tōkaidō Lines with a final destination of Nagoya Station. Satō Kiichi 佐藤喜 — recently observed that this was a fictional train not listed in the Travel Guide of that time.<sup>9</sup> However, even though it was not an actual train, it is interesting that Sōseki paid attention to its delays, which were quite ordinary for that time, and wrote that the train arrived forty minutes late at its final destination of Nagoya Station.

Sanshirō stays one night in Nagoya and then the next morning again boards the train to go from Nagoya to Shinbashi. According to a study of old documents by Satō, this train can be supposed to have been a local train, the No.24, departing Ōgaki Station at 6:30.<sup>10</sup> According to the timetable, this No. 24 would have arrived at Hamamatsu Station at 11:08, and then have departed at 11:14. "At Hamamatsu Station, the two of us [Sanshirō and Mr. Hirota] ate box lunches as if we had arranged it that way. Even after we finished eating, the train still was not ready to depart."<sup>11</sup>

Almost no readers of novels would have been interested in train delays. Nevertheless, I wonder if Sōseki wasn't trying to create an effect by putting a little verisimilitude into

his novel. As seen in the passage above, he also described the train having difficulty leaving Hamamatsu station. The keen sensitivity of Sōseki to the relation between railroads and time can be also seen in the place where he makes Sanshirō relate that “only the big clocks caught my eyes”<sup>12</sup> inside Nagoya Station. Such a sense of time as Sōseki’s did not merely reflect the activity of his wonderful sensitivity. It seems probable that when Sōseki was studying in England, he must have often visited railroad station buildings and seen the big clocks decorating them, and such experiences might also have inspired the description of the big clock at Nagoya Station used in *Sanshirō*.

## 2 INNOVATION IN THE JAPANESE GOVERNMENT RAILWAY AND ITS EFFECTS

The railroads in Japan at the beginning of the twentieth century could not maintain on-schedule train operation; on-schedule operation, however, was realized in the 1930s. Why was there such a change in Japanese railroads? To state my conclusion first, the answer lies in railroad innovation during the period from enactment of the Railroads Nationalization Law of 1906 until the 1920s. In order to consider this subject in detail, let us scrutinize the actual situation of time management to the minute in railroads of the 1930s by looking at several documents.

It can be said that train delays almost do not occur any more these days, not only because of what people do but also because of the use of capital in various ways. There used to be, until quite recently, trains that were often delayed because of yielding to the Fuji super express train, but now this kind of thing has completely disappeared. . . . However, the disappearance of delays is not only for passenger trains, but also for freight trains, as there is a separate line for freight trains only to the point of Hiratsuka, and farther to the west there are no separate lines, so one cannot count out freight trains. . . . This is the era of speed. At present the only service for passengers is speed. As for electric trains, these run on the more than twenty-three miles of the Yamanote circle line in exactly one hour, a reduction of six minutes from before. However, for all the workers, this six minutes is not just a mere six minutes. As every one or two seconds spent stopping at the stations counts, with about thirty stations on the line it is not so easy.<sup>13</sup>

Thus Itō Zensaku, the Stationmaster of Shinagawa Station in Tokyo, explains on-schedule operation and time management to the minute on the Japanese Government Railway in 1930. Itō uses the expression “the era of speed” here, and reflecting the rationalization of lifestyles, the 1930s was indeed a time of accelerating velocity. In the speed category, not only trains, but also automobiles and airplanes introduced remarkable innovations in traffic and transportation. Speed became the only standard for passenger service. The

Japanese lifestyle was changed by this to an extent that rules out comparison with the past. In the new “speed era,” the electric trains of the Japanese Government Railway could run the more than twenty-three miles of one circuit of the Yamanote line—encircling central Tokyo—in an hour, cutting six minutes off the time that had previously been needed. To make this six-minute reduction, it had become a situation in which “every second counts” for all who worked on the line. No other example better symbolizes the fixation of time management to the minute and second.

An important task in age of acceleration was the linkage of speed to safety. For this purpose, the engineer in the locomotive had to “keep watching the timetable together with an absolutely correct clock hung at the front of the engine-bed.” On-schedule operation required a thorough mastery of skills; moreover “the proper way to accelerate differed depending on such weather conditions as windstorms, heavy rainfall or snowstorms.” And since speedometers were not yet furnished in those days, except in a very few locomotives, it was required “to observe the speed while staying inside the engine-bed, quite a practice.”<sup>14</sup>

As evident from the two examples above, there was a qualitative break in railroad operations between the beginning of the twentieth century and the 1930s. This was a decisive change in the railroad operation system in Japan. The first thing we have to analyze is how such innovation in the railroad operation system progressed from the Railroad Nationalization Law of 1906 until the 1920s. The integration of railroad transportation was a requirement of Japanese capitalism on its road to development, but the military, from its experience in the Russo-Japanese War, also recognized the nationalization of the railways as a pressing problem:

In Germany, there is the example of railroad fees for export cargo being reduced to the level of actual expenses. As for the railroads in our country, in order to solidify the foundation for nationalization, there is a need to adjust the fee rates based on the policy of hastening the independence of the railroad economy. However, from the point of view of the national economy, the main duty of the railroads, which occupy the forefront among means of transportation, should be to encourage exports by lessening transportation fees, especially for export goods, and to animate domestic industry. (Report of the Special Survey Committee.) . . . People in both commerce and industry are saying that the insufficiency of the means of transportation is disadvantageous and inconvenient, while fees are not inexpensive, compared to foreign countries. *Although there are no complaints about the freight transportation capacity of the railroads in normal situations, once the economic sector demonstrates a little vigor and the circulation of freight increases, suddenly we start hearing of freight hold-ups, something we think is extremely regrettable.* (From a report by Wada Toyoharu, Hibiya Heizaemon, and Hamaguchi Kichiemon; emphasis added by the author.)

A document submitted in 1909 to Katsura Tarō in his capacity as minister of finance

in his own second cabinet explains the requirements for railroads after nationalization as seen by the business world.<sup>15</sup> Looking at freight fee rates, as did the writers of the document just quoted, business interests asked for decrease and unification. In combination with nationalization, their argument was effective, and the first, transitory reforms were implemented in October 1906. It is worth noting that the long-distance incremental decrease method was also put into effect for the freight transportation fees through this reform. Adoption of unified fee rates nationwide was realized with their reduction in October 1912. The regional expansion of the domestic market was facilitated solely by the reduction in the fee rates and the system of incrementally decreasing fee rates as freight distances increased. This became possible for the first time through nationalization itself.<sup>16</sup> Through nationalization, the increase of freight transportation capacity mentioned above clearly described a trend. That is, improvement in train allocations and operations reduced the time of freight holding and transportation, and this caused a reduction in the distribution time for the products.<sup>17</sup>

Additionally, after nationalization, the operation of long-distance trains increased gradually in terms of passenger transportation as well. However, as of April 1907, even on the Tōkaidō Line, which, due to its large volume of traffic, was legitimately called the “trunk line” among the previously government-established lines, there were, as direct trains between Shinbashi and Kobe, only three express and two local trains. The time required for the above section was thirteen hours and twenty minutes for express trains (fastest) and nineteen hours for local trains. I will illustrate the actual situation of trains running on the Tōkaidō Line during this period by drawing from *Tetsudō jihō*.

When I looked inside the train, thinking of boarding, it was completely full. Everywhere people were boarding to overflowing. There was no standing room, either. . . . The train had a capacity of about 350 persons and consisted of four third-class bogie coaches that were supposed to be for 100 persons, a restaurant car in the middle, brake vans at front and rear and a freight car at the rear for postage and small luggage and hand luggage. . . . For the dining car, a coach that had been previously divided between second-class and dining, with some repairs, was used and equipped with chairs and long benches for twenty-four persons, with leather cushions placed on all of the seats. . . . One thing I would like to mention here is that, compared to the extremely cramped conditions of the coaches, the dining car was like heaven, and thus there were many passengers occupying it, using eating and drinking as excuses. For example, by merely buying a small bottle of beer, or a cake or some fruit they would spend one or two hours—and in the worst cases some would just bring in box lunches and occupy the seats.<sup>18</sup>

Imanishi Rinzaburō, a director of the Hanshin Railway, recorded these impressions after taking a test ride on the third-class express train (departing Shinbashi at 7:30 a.m.) that had been newly established on 16 April 1906. As can be glimpsed in his descriptions

of this test ride, in those days the concentration of passengers on the Tōkaidō Line was high, especially for passengers on the express trains. First- and second-class express trains bound for Kobe, which departed Shinbashi Station one hour earlier than the above-mentioned third-class express trains, also became full as their speed won them popularity.<sup>19</sup> The sense of time of people in those days was quite loose; most led easygoing lives. However, as the value of express trains for long distance train travel became recognized, the number of travelers with rational notions regarding the relation between speed and train fees increased. *Tetsudō jihō*, in an article titled “Separation of Ordinary Trains and Special Trains Must Be Specified,” relates:

There are four direct trains to Kobe on the Tōkaidō Line. The two trains departing Shinbashi at 6:00 a.m. and 6:00 p.m. are both express trains and arrive in Kobe in about fifteen hours. The two trains departing at 12:30 p.m. and 10:00 p.m. are both local direct trains and do not arrive in Kobe until nineteen-and-a-half hours later. . . . In addition, a dining car is attached for the express train, and coaches with fine and beautiful decorations and other equipment are used, that is, new and improved coaches. However, for the local trains they use quite old coaches, and there is no diner. As for other means of providing comfort to the passengers, whereas for express trains everyone from top to bottom seems to be fearful of shortcomings in such things as the selection of train boys and care of the station staff, this is not so for local trains. . . . The difference between ordinary and special is already very clear, but the fees from passengers for both trains are exactly the same. How unfair and absurd.<sup>20</sup>

These passages were written in July 1905, just before nationalization. Speed as the criterion of superiority was certainly on the way to becoming one of the ideas that defined the era. In fact, on 16 April 1906, just after the proclamation of the Railroad Nationalization Law, it was decided for the first time to set the types of trains operating on the Tōkaidō Line as special express, express, and local. Thus it came to pass that express fees were established for passengers on special expresses, and express tickets sold. In 1912, the Imperial Japanese Government Railway started the operation between Shinbashi and Shimonoseki of first and second-class limited express trains with dome cars attached, and employing train managers. The passengers on these trains needed limited express tickets and seat tickets with seat numbers inscribed.

The Japanese Government Railway completed nationalization and greeted the 1910s. In this period, with World War I as a turning point, transportation volume increased dramatically together with the remarkable development of the Japanese economy. The transportation capacity of the Japanese Government Railway reached its limit and passenger transportation became hard-pressed, with freight backlogs continuing to increase rapidly. For example, the Tōkaidō Line, on which double tracking of all lines and a reinforcement of transportation capacity had been completed in 1913, came very close to

paralysis due to the epochal increase in transportation demand created by World War I. An article in the Tokyo Nichinichi Shinbun of 13 April 1918, "Massive Congestion in Chock-full Trains and Railroads Amazing," attacks the railroad authorities for "congestion encompassing all railroad lines reaching maximum levels after the beginning of April, with examples of exceeding fixed capacity and missed trains being too numerous to enumerate." The writer continues, "In particular, the crowding is even more severe and also the nuisance to passengers is even greater on the Tōkaidō Line. . . . What kind of countermeasures will the Railroad Agency adopt for this situation?"

In answer to such criticism, the authorities had no recourse but to resort to such statements as, "Since we have increased the number of cars as far as locomotive tractive force permits, we have no further capacity." The solution of chock-full trains was a matter of course for the Japanese Government Railway of those days, but an even more urgent task was the "speedy disposition of freight backlogs as a busy autumn for the business world approaches."

The transportation capacity of the railroad was limited and the reinforcement of its facilities was not likely to happen in a brief span of time. Therefore, from the end of 1916 the increase in freight backlogs became even more severe, and in the autumn of 1917 it ratcheted up yet another degree, and to top this, at the beginning of the next year, it reached the ultimate limit of transportation capacity. This crisis, as I shall explain, led to the realization of on-schedule train operation. Ishida Tarō, who filled successively the posts of Operation Section Chief, Sendai Railway Office Chief, and Kobe Railway Office Chief and had a thorough grasp of the situation in those days, states:

With the progress of the change of the times, trains increased, new lines were established and single tracks were expanded into double tracks. Accordingly, the number of newly hired people increased, and a keen awareness arose of the necessity of their instruction and training. In addition to the training of chief locomotive engineers, locomotive crew manuals were created and distributed to ordinary people inside the sections, helping them to teach themselves and making it easy for recently hired people to learn and master the techniques and business routines. A little while later, a training school for engineers and boilermen was established. Thus, from around 1915 or 1916, trains throughout the jurisdiction began to operate on time. Later on this became customary and the bad reputation with the public of trains being generally delayed was thoroughly purged.<sup>21</sup>

Thus was born the on-schedule train operation of which the Japanese Government Railway could be proud before the world. Concerning the realization of on-schedule operation of trains, Ōshima Fujitarō points out, "It was born under conditions in which, to meet the demand for transportation that increased abnormally around the time of World War I, the additional investment of funds was small. Compared to the increases in passengers and freight, increases in cars and equipment, which naturally should have

been made, were insufficient. . . . Such ‘excellent’ results were not attained by the adoption of new machinery and equipment, but through the accumulation of skilled ability in each individual Japanese Government Railway worker, and were the product of extraordinary intensification of labor.”<sup>22</sup> I heartily endorse Prof. Ōshima’s remarks. However, it goes without saying that the continuing accumulation of ability of “individual skilled” workers is not sustainable. Plainly speaking, maintaining on-schedule train operations as “the product of extraordinary intensification of labor” was not the only basic factor directly supporting the above-mentioned time management to the minute according to a fixed schedule by the Japanese Government Railway in the 1930s.

Then how should we comprehend the relation between maintaining on-schedule train operations in the 1910s, which was “the product of extraordinary intensification of labor,” and the maintaining of time management to the minute and second in the 1930s? In order to resolve this point, I want to analyze the issue of innovation, which progressed remarkably by means of full-scale capital investment into the Japanese Government Railway in the 1920s. This innovation took several forms: domestication of the production of large-type locomotives and electric locomotives with powerful traction, improvements in the slope of rails on trunk lines (note the opening of the Tanna Tunnel on 19 June 1933), mounting of automatic couplers on all cars, adoption of pneumatic brakes on all cars, expansion of electrified lines, and other changes. The 1920s was a period in which the mindset was converted. In response to the crisis of the crush of passengers and freight transportation on the Japanese Government Railway, the focus shifted from supplementing the shortfall of investment of funds with “extraordinary intensification of labor” to innovation that made capital investment its lever. Due to the influence of party politics on government at that time, innovation did not progress in a linear fashion. Railroad construction for political motives and factional infighting became overt, and traps were laid to cause setbacks to the renovationist factions, typified by the issue of broad gauge track construction.

Next, let us consider the political issues surrounding the Japanese Government Railway. First, what about the Kenseikai party? Having had, since its foundation, a strongly urban tinge representing the strata of business and industry persons, the Kenseikai advocated taking measures for fundamentally reconsidering such things as transportation equipment and cars, supporting innovations, and reinforcing transportation capacity. And what about the Seiyūkai party? The Seiyūkai party had a strong base in farming villages and depended on landlords and merchants, stressing the construction of new lines in rural areas over giving importance to smooth transportation of the labor force and products. Against such a political background, focussing attention on the two positions in the discussion of broad gauge track reconstruction (reconstruction of narrow gauge rails of about 110 cm to broad gauge of about 145.5 cm) among the policies of the Japanese Government Railway, Prof. Ōshima states:

Among the supporters of broad gauge were Gotō Shinpei (president of the Railroad

Agency), Nakamura Korekimi (president of the Railroad Agency), Sengoku Kōichi (railroad minister), Shiraishi Naoharu (professor at Tokyo Imperial University), Furukawa Hanjirō (vice president of the Railroad Agency), Shima Yasujirō (technical manager of the Japanese Government Railway), Kinoshita Toshio (business office chief of the Japanese Government Railway), Ōsawa Kaio (transportation department manager at staff headquarters), Ishimaru Shigemi (vice president of the Railroad Agency), Ōmura Shōtarō (Japanese Government Railway construction office chief), and others. . . . In 1918, with the rice riots as a stimulus, the Terauchi Cabinet collapsed and the Hara Takashi Cabinet of the Seiyūkai party, called the first “party cabinet” in Japan, was inaugurated. As a result, the presidency of the Railroad Agency switched from Nakamura Korekimi to Tokotsugi Takejirō. In the Diet of the next year, 1919, a halt of broad gauge reconstruction was announced, and all too easily was lost that one chance in a million to change the narrow gauge rails, which made our Japanese Government Railway rest on a “colonial-type” foundation, to broad gauge.<sup>23</sup>

It must already be clear why the Hara Cabinet scuttled the measures for the upgrading of trunk line transportation by reconstruction with broad gauge. Concerning the situation in which the broad gauge supporter group was all swept away by the fixation with self-serving political measures, Ōkura Kinmochi, the Freight Section Chief at that time, says:

The first task Mr. Ishimaru [Ishimaru Shigemi, vice president of the Railroad Agency] performed was to sweep away the people from the Kinoshita group. And I, too, was chased out to be Transportation Section Chief of the Western Parts of the Railway Office after I had been in my previous position for only seven months. . . . I am certain that the politicizing of the railroads began in the Ishimaru era, and this is extremely regrettable.<sup>24</sup>

Even though the group of leading bureaucrats in the Japanese Government Railway that was connected to the lineage of the broad gauge reconstruction argument was defeated, the innovation in the Japanese Government Railway that they had promoted since around the beginning of the 1910s became a stimulus for the breakthrough in the crisis of passenger and freight transportation. Additionally, this contributed to the speeding up that reduced the time required between the capital city of Tokyo and other cities. These cities communicated with each other through the medium of multidirectional economic activities, development of transportation and traffic, communications technology, and the like, and formed the foundation of open and vigorous modern urban structures.

Automatic couplers were of great significance. Among the innovations that advanced remarkably from the 1910s to 1920s, the mounting of automatic couplers was a measure

of the improvement of railroads that could not be realized even in England, the pioneer country of railways. In the United States, where railroads were built much later than in Europe, automatic couplers were adopted from quite an early stage, but railroads in the advanced countries of Europe, epitomized by England, used screw couplings, and so did Japan. Countries on the European continent had narrow areas of land bordering others, and each had a different railroad situation. Moreover, there were international direct trains, and in this circumstance, it was not possible for just one country to mount automatic couplers. However, the fact that England was still using old-fashioned type couplers, even though, as an island country like Japan, it did not have to deal with trains running across borders, shows how difficult a task it was to change them all at once. As will be shown later, very high risk was associated with screw couplings in connecting operations, and every country shared the common anguish over the many deaths and injurious accidents to brakemen. The International Labor Conference in Geneva, Switzerland, adopted in October 1923 a resolution on the safety issue to arouse the attention of each country:

Believing that the issue concerning automatic couplers to be important to the safety of railroad workers, and in order to decide whether or not an international agreement on this matter is desirable, the Fifth International Labor Conference has requested the Labor Administration to obtain information from the governments of each country and from international technological and industrial organizations.<sup>25</sup>

In those days, the adoption of automatic couplers was an issue for European railroads as well, but their mounting had not exactly been planned on any particular schedule at all. Japan, however, tackled this subject squarely, as we will see below. In response to the above resolution of the International Labor Conference, a report titled “The Automatic Coupler Issue in the Japanese Government Railway” was submitted in November 1924 through the Social Office of the Interior Ministry. This report drew international attention. Thus, the operation of mounting automatic couplers that was carried out by our country was a unique pioneering innovation in the world. It also deserves special mention that overall operational efficiency was epochally increased by the application of time and motion studies, regarded as extremely important among scientific management methods. In the next section, this subject will be considered by focusing on the problem of mounting automatic couplers on all cars.

### **3 TIME AND MOTION STUDY AND ESTABLISHMENT OF THE ON-SCHEDULE SYSTEM**

At the beginning of the twentieth century, Japan was using screw couplings in railroads in Honshu, Kyushu, and Shikoku—everywhere except Hokkaido (where every-

thing was integrated with automatic couplers in and after 1909). The screw coupler was composed of a loop and threaded rod mounted at one end of a car, and a chain coupling device—made up of three chains—mounted at the other end of the car. In order to couple the cars, a loop of the screw coupler at one end of car A must be looped over a hook of one end of car B and held there by a threaded rod in the center, then a loop from the chain coupler of car B has to be looped over the hook of car A. The chief difficulty of this coupling operation is that the brakeman has to enter into the narrow space between cars and pick up the screw coupler, which weighs as much as about twenty kilograms, and loop it over the hook on the other car. Coupling operations at that time not only required proficiency but were also extremely dangerous. If the brakeman made a mistake, he could lose his life by being smashed between cars. Out of the number of deaths and injuries to brakemen engaged in switching operations (in Honshu) in 1922, as many as 167 of the 355 of these occurred during decoupling and coupling operations. Out of the number of deaths or injuries to brakemen doing switching operations (in Hokkaido) in that same year, four of the thirteen of these occurred during decoupling and coupling operations.<sup>26</sup> Because these dangerous coupling and decoupling operations took quite a bit of time, they were huge obstacles to train speeds and to freight train operating efficiency.

Since the foundation of the Japanese Government Railway, one of the biggest events concerning the mounting of automatic couplers must have been the integration of automatic couplers in the cars of Hokkaido in 1909 by Shima Yasujirō, the Chief of the Machine Section. Screw couplings were used at that time for cars in the rest of Japan, and although there were some improvements, the adoption of automatic couplers was only occasionally an issue, and one that had never been realized. The winning essay in a contest conducted by *Tetsudō jihō* in August 1905 shows such a tendency inside the railroad:

To the question of how much it costs to change the Type A (screw couplings) to the Type B (automatic couplers), referring to the expenses for the change on the Hokkaido public lines, the average price for two Type B couplers (with accessories) was about 90 yen, and about 70 yen more was required to mount the new equipment after the remodeling of Car A, so altogether for one car a remodeling fee of 160 yen was required. Then supposing that the number of cars, excluding Hokkaido and Taiwan, is 26,000 (the total of locomotives and cars), the total cost would be no less than in the neighborhood of 4,160,000 yen. No matter how good the idea may be, it is impossible to hold the expense for 26,000 cars to a small amount. . . . Although this problem has been regarded as very important in our country, too, there has not been any special invention other than the two types, and if a new type could be invented, if it were just a little better than the present ones, we would not be able to invest the amount of money for the above-stated remodeling. So the best route must be to make improvements based on Types A and B. . . . Therefore, I con-

clude that the perfect train coupler for application in our country is the latest “Janny” style automatic coupler (the latest one, the type used in the United States, light and appropriate for the cars in our country) used by the Hokkaido Line Operations Office for Taiwan, Hokkaido and nearby islands. For Honshu, Kyushu, Shikoku and nearby islands, the latest screw coupling in use by the Operations Office should be used.<sup>27</sup>

As pointed out in this 1905 prizewinning essay, industry experts had considered adoption of automatic couplers on the grounds that it was necessary to integrate couplers after the nationalization of the railroads, but there was a great deal of opposition because of the huge costs and other things that would have been required. It was not until after 1918 that consciousness of the adoption of automatic couplers started to arise inside the Japanese Government Railway. In 1918, Shima Yasujirō, the chief manager of the Machine Office, was sent to the United States as an envoy of the railroad by order of Gotō Shinpei, the president. As the conclusions of his inspection, Shima summarized measures for the Japanese Government Railway in three points: first, to adopt automatic couplers and to make the operation of long trains possible as well as to attempt to ensure the safety of the brakemen; second, to adopt pneumatic brakes—using continuous brakes for freight trains also—and to attempt the safe operation of long trains; third, to encourage the construction of sidings to manufacturing factories and warehouses, and the like, to lessen short transits. The president at that time, Gotō’s successor Nakamura Korekimi, adopted Shima’s suggestions, and they were approved in a resolution of the Railroad Agency during budget preparations for fiscal year 1919. Then, in 1923, a research committee concerning implementation of automatic coupler mounting was formed in the Railroad Ministry (which was established in May 1920).

On 16 July 1925, the Japanese Government Railway carried out in a single day the simultaneous nationwide adoption of automatic couplers. The changeover affected 3,205 locomotives, 8,544 passenger cars and 51,552 freight cars.<sup>28</sup> As the *Asahi* newspaper of 18 July reported, “The record times for the mounting of single cars at Tokyo Station were four minutes for a locomotive, sixteen minutes for a passenger car, and thirteen minutes for a freight car.” This meant that Japan had actually succeeded in overtaking its mentor country, England, in railway technology, and it was enough to make railroad experts around the world marvel. In addition to the presence of numerous newspaper writers and 254 members of the Mechanical Engineers Society for this mounting operation of automatic couplers, inspection tours were made by groups of railroad engineers from China and England and engineers from the Alliance Automatic Coupler Manufactory in the United States. It was noted in the *Asahi Shinbun* of 17 July 1925 that “railroad workers came all the way” from China and India to inspect this “world-class operation.”

The automatic coupler had numerous functions that made it superior to the screw coupling. With the old type coupler, both spiral and chain couplers were mounted at the

front and rear of cars. With the automatic coupler, only one kind of coupler was mounted at the front and rear of cars. No manpower was required for coupling operations and it could be done automatically. Moreover, as the front and rear units were the same type of equipment, the direction of cars could be changed without it becoming necessary to change any equipment. To separate cars, it was sufficient just to pull a lever lightly from the outside of the cars, so coupling operations were speeded up in safety, and as a result fatal accidents or injuries were almost eliminated. The tractive force possible with automatic couplers was several times greater than with the old-fashioned ones, and the length of the couplers was shortened by about thirty-six centimeters. Thus, due to such capabilities, it became possible to increase the numbers of cars connected to trains. In response to the crunch of passengers and freight transportation in the World War I period, the Japanese Government Railway made efforts to reinforce the tractive force of locomotives. In order to strengthen the tractive force of a locomotive itself, it was necessary to enlarge the firebox for coal consumption. For this purpose, the Japanese Government Railway combined small drive wheels and enlarged boilers and manufactured locomotives for the exclusive use of Type 9600 freight trains, an epochal narrow gauge train. As a result, the average number of freight cars coupled to one train increased 45%—from 28.1 cars in 1916 to 40.8 cars in 1921.<sup>29</sup> Domestic large-type locomotives and large-type electric locomotives, which appeared one after another in the 1920s, not only remarkably increased this coupling capacity, but also succeeded in speeding things up through having automatic couplers mounted. The construction of the Tanna Tunnel, the mounting of automatic couplers, the rationalization of manufacturing of large-type locomotives and large-type electric locomotives and the adoption of pneumatic brakes for all cars symbolize innovation in the Japanese Government Railway in the 1920s.

The epoch-making automatic coupler mounting project, a project to surpass the railroad technology of Europe, was suggested and performed by the technicians group of the Japanese Government Railway led by Shima. These were outstanding technicians who had been brought together from several previously private railroads on the occasion of nationalization. In the sense that they attempted the nationwide integration of railroad technology and its development, they can be called pioneers who were attuned to the latest technological currents. They systemized the railroad factories nationwide and led the installation of automatic couplers, splendidly scoring brilliant successes as general project managers. The highly advanced aspect of this group was that they had the technological sense to regard time and motion studies as important during preparatory operations.

Full attention must be paid to the fact that time and motion studies in the Japanese Government Railway began under the influence of U.S. industrial management. Japanese engineers at the time had read about time and motion study in the United States, which was the most advanced in the world, but until they went to study in America they had little knowledge about the actual situation of the business management movement, which had progressed remarkably in connection with the management of factories since the end of the nineteenth century. Here, I must note the example of

Frederick Winslow Taylor (1856-1915), who became the chief engineer of the Midvale Steel Company in Philadelphia in 1882 and established the foundations of scientific factory management methods. He conceived what he called the “Duty of the Manager” based on his duties inside the company, and summarized it thus:

1. Allow science to develop each element of human operations and thereby halt the old-fashioned reliance on guesswork.
2. In place of the previous way in which the workers themselves decided the amount of work or refined their skills, select the most superior operators for each specific operation, perform educational training, and endeavor to have them make progress.
3. Seek harmonious cooperation between managers and workers to promote the execution of activities based on the principles of advanced science.
4. In place of the previous way in which the majority of major responsibilities were imposed on the workers, allocate the duties equally between managers and workers so that each can be in charge of the area most appropriate for each.<sup>30</sup>

One of the major aims of the Taylor system of scientific management was to promote “harmonious cooperation between managers and workers” as elucidated above. Taylor said that the “Duty of the Manager” was to make the transition from the “previous way in which the majority of major responsibilities were imposed on the workers” to scientific management. It was natural for the criticism of labor unions to be directed at the Taylor system for this reason. However, during World War I, the recognition of human factors in productivity was deepened for both labor and capital. After World War I, the American Federation of Labor (AFL, founded in 1886) became friendlier towards scientific management because of the experience during the war. We know that in labor unions, criticism was beginning to arise of the many entrepreneurs who were attempting to improve industrial efficiency by traditional means.

The circumstances described here have shown that if the Japanese Government Railway tried to renovate itself, the effort would have to be connected with the direction of new business management. Around 1912, Yamashita Okiie, a technician of the Japanese Government Railway, made a business trip to the United States and there for the first time recognized that car repair technology associated with time and motion studies had made striking advances. Regarding this, Yamashita stated:

Operation research was so-called “motion study” and I had seen it in books, and had thought it could be implemented for mass production or precision industry, but when I went to America, it was actively being done in the repair shops there. . . . Locomotive repairs were being done there in about a week to nine days. And freight cars were being repaired in just one day. In Japan in those days, work was taking forty to fifty days for locomotives and fifteen days for freight cars.<sup>31</sup>

Yamashita's observations show clearly that in relation to the development of the rationalization of business management in the twentieth century, it was a period when the technician group of the Japanese Government Railway was forced to tackle the time study problem squarely. Not just a matter of locomotive or freight car repairs, the situation developed so that what was required was a concept behind the construction of the technology system of the Japanese Government Railway that corresponded to the tidal currents of international business management.

It is true that the level of enlightenment of Yamashita, who learned from American time and motion studies, surpassed what he had acquired domestically, and it affected the entire Japanese Government Railway. The era had come when the support and concern of technicians and workers nationwide effected the establishment of time and motion studies. Years later, Yamashita Okiie recalled this:

I asked Mr. Noda and Mr. Katō [author's note: Noda Nobuo and Katō Takeo of Mitsubishi] and had them give many lectures, then selected people from railroad factories all over the country, training many to be specialists. That is why the railroads broke the ice in Japan for the beginning of large-scale motion studies. We later decided to call the motion studies that I have just mentioned "operation research."<sup>32</sup>

The basic concept of "operation research" of the Japanese Government Railway by central technicians such as Yamashita Okiie was to educate systematically the people selected from factories all over the country, to make them the elite of operation research, and to attempt to improve the technology environment in factories from the bottom up. Rather than technicians conducting research individually, they created a research system and performed operation research on the whole Japanese Government Railway.<sup>33</sup> Therefore, it was natural that the Japanese Government Railway played the leading role among the nation's industries in the deployment of time and motion studies. Let us now investigate the pedigree of industrial efficiency research in Japan. Hoshino Yukinori 星野行則 translated the writings of Taylor and published them under the title *Gakuriteki jigyo kanri ho* in 1911. The next year, in 1912, *Scientific Management* was published as an unscheduled issue of *Jitsugyokai*, with Iseki Jūjiro 井関十二郎 as editor-in-chief. Outside the country, efficiency lectures hosted by the Manchurian Railway (lecturer, Ueno Yōichi) were held in Dairen in 1926. The "Manchurian" efficiency research group originated in the next year, 1927. However, in Japan in the early years of the twentieth century, time studies and motion studies did not spread beyond the areas of research and informational activities. The very few examples of actual exercise of scientific business management principles included the operation research by Ueno Yōichi at the Lion toothpaste factory in 1920, the enforcement of scientific management methods at Nakayama Taiyōdō and Fukusuke Tabi K.K. in 1921, also by Ueno, and the commencement of efficiency research by the Mint Office in 1923.<sup>34</sup> As has already become clear, in establishing a pedigree for research and application of time and motion studies in Japan,

the Government Railway was far ahead of the herd.

Our glance at the relation between time and motion studies and the mounting of automatic couplers has diverted us into the problem of the pedigree of scientific management in Japan. Returning now to the main subject, let us confirm how operational efficiency was raised by the adoption of time and motion studies at the preparatory stage for the mounting of automatic couplers. Practice for the changing operation for automatic couplers began around 1924 or 1925 in each factory under the Japanese Government Railway. It was conducted especially in each factory and locomotive inspection place, in order to “determine the most appropriate operation method and establish it as the standard, and to train the ordinary workers”:

From early on in this operation, time and motion studies were performed, and we conducted scientific research on how to eliminate idle or racing states, and how to lessen fatigue in the case of consecutive operations; we investigated the number of persons for one group, the share in the operations of each person, the equipment to hold and the order of operations. . . . We conducted practice in each factory in a competitive style...to give proper impetus to the competitive spirit, because what is most effective in increasing efficiency at work is for each person to have excitement in the heart. . . . We attempted to make thoroughly clear to everyone that the responsibility of factory workers in the automatic coupler mounting operations was significant, because what is most effective in increasing efficiency is everyone recognizing his own responsibility and exerting himself voluntarily.<sup>35</sup>

Through the use of time and motion studies, the level of skill in the changing operations was rapidly improved. In each factory there were many technicians who, by learning the scientific management method, came to understand well the importance of manpower. Various contrivances concerning research on the equipment to be used, how to create competitions for skill acquisition, the idea of responsibility for labor and the like were developed out of the dialogue between these technicians and the workers. The best ideas and know-how among these were immediately standardized and transmitted to factories all over the country. Such efforts by railroad workers can be seen, for example, in the following report about preparative practice for locomotive shed workers:

Fundamentally employees in the shed do not have hourly wages corresponding to those of Class 3 employees in factories, and unless there is an atmosphere in which employees hone their skills of their own volition, it will be difficult to perform sufficient preparations.... Not only have we considered ways of creating manpower by rationalizing the density of personnel allocations and thereby reorganizing again and again the turns of staff members in the shed, but we have also attempted to improve the actual performance of drills in work skills by attempting increases in net labor hours by such things as extending working hours or abolishing official holidays. The

fact that nobody has ever complained about this and everybody has given service is worthy of special mention.<sup>36</sup>

Practice drills for mounting of automatic couplers intensified from around December 1923 in locomotive sheds and inspection buildings nationwide. A competition was conducted pitting factories against each other on a regional basis, and an extremely high level of ferocity was reached. During the period of practice for automatic coupler installation, the Japanese Government Railway attempted an across-the-board imposition of time and motion studies in factories, locomotive sheds and inspection places. Additionally, in order for all workers to understand the operational details upon training in each office, they studied how the operations should be conducted and performed simple technology training.<sup>37</sup> As a result, an exact analysis of the time required for the efficient execution of the operations and operational methods were established, and the previous operational style that depended on the instincts of workers and traditional customs was radically uprooted. This innovation resulted in “great performance on the day of the overall change.”<sup>38</sup>

As we have seen, time and motion studies gradually penetrated into the working style and psychology of workers, and their consent to scientific management was obtained. On 6 July 1925, the section chief of the personnel affairs section sent instructions to the head of each railroad office, titled “Matters Concerning Special Bonus Payments for Persons Involved in the Changing of Couplers.” These instructions explained that the scope of rewards was to include Junior Officials and those below them, and that one share of allocation was to be at most 20 yen per person.<sup>39</sup> Advocates of the rationalization of the Japanese Government Railway succeeded in drawing total cooperation from the workers on the big project of changing the automatic couplers by affirming Taylorism and bringing the workers into its framework. That is, even though the workers were pushed into the all-out control of labor and personality as a result, they cooperated voluntarily.

The organization where workers preserved their rights from the extraordinary intensification of labor was the labor union. How did the labor union, in the form of the Operation Committee Support Association, established in September 1924 (reorganized as the All Japan Railway Employees Union in 1926),<sup>40</sup> fight against Taylorism? This union was too weak in the organizational and conceptual aspects, in any event, for the workers gathering in the newly born union to announce their disapproval of the introduction of Taylorism, or to manage their labor voluntarily according to their intention and benefit as a group. What did it mean that the workers in the Japanese Government Railway could not defend themselves against the fierce onslaught of rationalization? In a word, it meant that the innovation of the Japanese Government Railway, which reformed the traditional labor style, was accompanied by such problems as authoritarianism, the intensification of labor, psychological tension and low wages.

On the other hand, the big project of mounting automatic couplers was a success

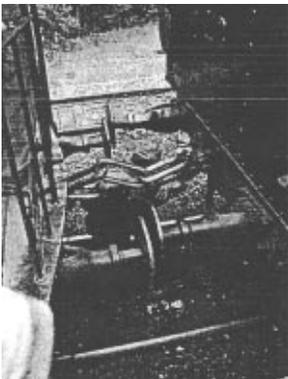
that could be vaunted before the world. As such it caused the importance of tightening up time to be recognized throughout the Japanese Government Railway system, and dissolved the old character of railroads which since the middle of nineteenth century had supported the loose sense of time. As a result, in the 1930s the Japanese Government Railway succeeded in on-schedule operation in which every minute and second counted. In this sense, the success of the automatic coupler mounting project was a symbol of the time revolution in the Japanese Government Railway in the 1920s.



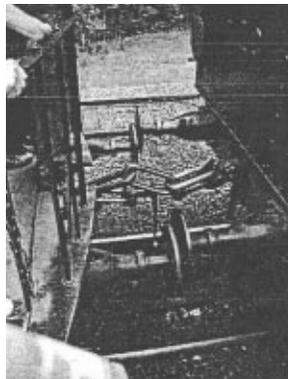
1. Connecting the screw coupler.



2. Connecting the chain coupler.



3. Coming out after connecting.



4. The connection is completed.

Demonstration of the operation of the screw coupling (Museum Meiji-Mura)  
(photo by Hashimoto Takehiko)

## NOTES

<sup>1</sup> Ōwada Tateki 大和田建樹, "Kisha ryokō," *Taiyō*, 1:5 (1895), pp. 65-68. Ōwada, a scholar of Japanese literature, was also the author of the lyrics of "Tetsudō shōka" (May 1900), which starts

- with the phrase, “Kiteki issei Shinbashi o. . . .”
- <sup>2</sup> Jūō Michito 縦横道人, “Bōnen ryokō (zoku),” *Tetsudō jihō*, 2 (1899).
  - <sup>3</sup> “Kyūkō ressha no enchaku,” *Tetsudō jihō*, 296 (1905).
  - <sup>4</sup> Satō Sei 佐藤生, “Naniwa dayori,” *Tetsudō jihō*, 423 (1907).
  - <sup>5</sup> Nakamura Naofumi 中村尚史, *Nihon tetsudōgyō no keisei*. 1869-1894 (Nihon Keizai Hyōronsha, 1998), p. 39.
  - <sup>6</sup> Tetsu Kotsuo 鉄骨生, “Shasō bekkenroku,” *Tetsudō jihō*, 123 (1902).
  - <sup>7</sup> Ibid.
  - <sup>8</sup> Natsume Sōseki 夏目漱石, *Kusamakura*, in *Sōseki zenshū*, vol. 4 (Iwanami Shoten, 1956), pp. 124-125.
  - <sup>9</sup> Satō Kiichi 佐藤喜一, *Kiteki no kemuri ima izuko* (Shinchōsha, 1999), pp. 186-187.
  - <sup>10</sup> Ibid., p.190.
  - <sup>11</sup> Natsume Sōseki, *Sanshirō*, in *Sōseki zenshū*, vol. 7, p. 17.
  - <sup>12</sup> Ibid., p. 12.
  - <sup>13</sup> Itō Zensaku 伊藤善作 (Stationmaster of Shinagawa Station), “Makoto ni supiido jidai! Soredake kushin mo ōi,” *Sunday Mainchi*, 9: 21 (1930), p. 32.
  - <sup>14</sup> Kurokawa Saburō 黒川三郎 (Engineer of Osaka Railway Office, Suita Locomotive Storehouse), “Mojidōri ni tokei no hari no watashitachi,” *Sunday Mainchi*, 9, 21 (1930), pp. 32-33.
  - <sup>15</sup> This document, *Honpō jigyō kaifuku ni kansuru jitsugyōka no ikensho*, is in my private possession. Marked “secret,” it was written by Masuda Takashi, Sōda Heigorō, and Nippon Kangyō Bank President Takahashi Shinkichi and others. Katsura’s two terms as prime minister were June 1901-January 1906 and July 1908-August 1911.
  - <sup>16</sup> Tominaga Yūji 富永祐治, *Kōtsū ni okeru shihonshugi no hatten: Nihon kōtsūgyō no kindaika katei* (Iwanami Shoten, 1953), pp. 192-196.
  - <sup>17</sup> Ibid., p. 195.
  - <sup>18</sup> “Santō kyūkō shijō Imanishi Rinzaburō-shi dan,” *Tetsudō jihō*, 345 (1906). The dining car was Suiryōken of Osaka.
  - <sup>19</sup> Mikami Shingo 三上真吾, “Tōkaidōsen no ‘santō kyūkō ressha’ to ko Sir James Allport,” *Tetsudō jihō*, 340 (1906).
  - <sup>20</sup> *Tetsudō jihō*, 306 (1905).
  - <sup>21</sup> Hirose Shinichi 広瀬真一, in Inoue Kyōshiro 井上匡四郎, ed., *Kokutetsu no kaiko: senpai no taiken dan*, (1952), p. 140.
  - <sup>22</sup> Ōshima Fujitarō 大島藤太郎, *Kokutetsu* (Iwanami Shinsho, 1956), p. 60.
  - <sup>23</sup> Ibid., pp.45-46.
  - <sup>24</sup> *Kokutetsu no kaiko: senpai no taiken dan*, pp. 53-54. Professor Ōshima Fujitarō points out the fact that Nakagawa Masaza was installed in the position of Transportation Office Chief in place of Kinoshita Toshio, Bachelor of Engineering, as an event symbolic of the wholesale changes of personnel affairs started by Ōkura Kinmochi. With this personnel transfer as a lever, the Operation Office and Transportation Office Chief, a pillar of railroad operations, became a post for a Bachelor of Law, according to Ōshima Fujitarō, “10: Kanryō to keieisha: Kokutetsu no baai,” (*Sōsho*) *Gendai no shakai kagaku: kindai Nihon kōtsu shi*, ed. Hirooka Haruya 広岡治哉 (Hōsei Daigaku Shuppanyoku,

- 1987), p. 128.
- <sup>25</sup> *Dai 5-kai kokusai rōdō sōkai hōkokusho* (Ministry of Foreign Affairs, 1924), p. 195.
- <sup>26</sup> Akiyama Shōhachi 秋山正八, “Tetsudō sharyō no renketsuki torikae ni tsuite,” *Nihon kagaku gijutsuushi taikai*, vol. 18, *Kikai gijutsu*, ed. Nihon Kagakushi Gakkai (Daiichi Hōki Shuppan Kabushikigaisha, 1966), p. 194.
- <sup>27</sup> Washizaki Bunzō 鷺崎文三, “Honpō tetsudō ni tekiyō subeki kanzen naru ressha renketsu sōchi (1-2),” *Tetsudō jihō*, 307, 308 (1905).
- <sup>28</sup> *Tetsudō sharyō no renketsuki o jidō renketsuki ni torikae ni kansuru kiroku*, ed. Noda Masaho 野田正穂, Harada Katsumasa 原田勝正, Miki Eiichi 三木栄一 and Oikawa Yoshinobu 老川慶喜, vol. 6 of *Taishōki tetsudōshi shiryō, dai-2 ki* (Nihon Keizai Hyōronsha, 1991), p. 30.
- <sup>29</sup> Ōshima Fujitarō, “Daitoshi chiiki no keisei to kansen tetsudō no hen'yō: kaisei tetsudō fusetsuhō to tatenushi kajū seisaku no tenkai,” in Hirooka, (*Sōsho*) *Gendai no shakai kagaku: kindai Nihon kōtsūshi*, p. 159.
- <sup>30</sup> W. R. Spreegel and R. H. Ramsberg in *Kōjō kanri 1*, trans. and ed. Takamori Kazuo 高盛一雄, vol. 3 of *Amerika keieigaku taikai*, gen. eds. Awaji Enjirō 淡路圓治郎, Nakanishi Torao 中西寅雄, Noda Nobuo 野田信夫, Ono Hironori 小野寛徳, Takamiya Susumu 高宮晋, and Uno Masao 宇野政雄 (Nihon Seisansei Honbu, 1961), pp. 39-40.
- <sup>31</sup> *Kokutetsu no kaiko: senpai no taiken dan*, p. 239.
- <sup>32</sup> *Ibid.*, p. 240.
- <sup>33</sup> Kishiyama Kenji 岸山憲二, the factory manager at Yokkaichi, was one of the pioneers of efficiency research in the Kansai area. He attempted to reduce the number of repairs on the locomotives in the factories and pushed operations research and the rationalization of factory management. As a result, he succeeded in reducing the number of repair days for locomotives to only seven days. *Ibid.*, p. 138.
- <sup>34</sup> Ueno Yōichi 上野陽一, *Sangyō nōritsu ron* (Chikura Shobō, 1929), pp. 96-102.
- <sup>35</sup> Akiyama, “Tetsudō sharyō no renketsuki torikae ni tsuite,” pp. 71-72.
- <sup>36</sup> *Ibid.*, pp. 80-81.
- <sup>37</sup> At the Takatori factory of the Japanese Government Railway in Kobe, they arranged it so that changing technology did not require special techniques and everyone could participate after mastering the skills. They organized operational teams of seven persons per unit from April 1925, making the instructions so that each member of the team could perform their share of the operations quickly and correctly. For this purpose, numerous practice sessions were necessary and they rented a freight car for each office for practice. They rewarded medals for the superior team in the office competition contest. At the factory, on the very day of the changing operation, 17 May 1925, in order to carry out the changing all at once, every person, provided he has male, even painters or upholsterers, was made to engage in the operation. *Takatori kōjō kaisō (Sōgyō 100 nen no kinen)*, comp. Takatori Kōjō 100-nenshi Henshū Iinkai, Nishi Nihon Ryokaku Tetsudō Kabushikigaisha Kobe Kōjō, (published by the compilers, 2000), p. 8.
- <sup>38</sup> Akiyama, “Tetsudō sharyō no renketsuki torikae ni tsuite,” p. 80.
- <sup>39</sup> *Ibid.*, p. 285.
- <sup>40</sup> The system of the Onsite Operation Committee was of a top-down advisory body set up in order to prevent the organizing of a labor union. After the Great Kantō Earthquake of 1923, the “Union,”

which was established for approving this Onsite Operation Committee, was the Onsite Operation Committee Support Group. As for the members, railroadmen and below who were engaged in railroad operations were the regular members and junior officials and above were supporting members. At first the number of members was about 2500, all of whom were Tokyo area workers. The group was renamed the “All Japan Railroad Employees Union” in February 1926 and reborn as a pure labor union. Ōshima Fujitarō, *Kokka dokusen shihon to shite no kokuyū tetsudō no shiteki hatten* (Itō Shoten, 1949), p. 208.