

80

3253
CHI-127

~~110~~
Copy! 5417/25

Copy No. 29
CONFIDENTIAL

DEPARTMENT OF JUSTICE
WAR DIVISION
ECONOMIC WARFARE SECTION

REPORT ON
JAPANESE RAILWAY TUNNELS

OCTOBER 27, 1943

Submitted by:
Charles Layng and
Richard Babcock
Economic Warfare Section
Department of Justice
Chicago, Illinois

T A B L E O F C O N T E N T S

	<u>Page</u>
Introduction	1
The Tanna Tunnel	1-8
The Kwammon Tunnel	8-9
The Aoyama Tunnel	9
Tunnels Definitely Located:	9-15
Island of Kokkaido	9-10
Hakodate Main Line	9
Muroran Main Line	10
Island of Honshu (Main Island)	10-15
Tokaido Main Line	10
Yokosuka Line	11
San Yo Main Line	11
San In Main Line	11
Tohoku Main Line	12
Tohoku Line (Joetsu Line)	12
Tohoku Line (Joban Line)	12
Kwansai Main Line	13
Chuo Main Line	13
Chuo Line (Shinonoi Line)	13
Hokuriku Main Line	14
Shin-Etsu Main Line	14
Uetsu Main Line	14
Ban Etsu West Line	15
O-U Main Line	15
Tunnels Not Definitely Located	15-17
Island of Hokkaido	15
Sekihoku Line	15
Nemuro Line	15
Ishikita Line	15
Muroran Main Line	15
Island of Kyushu	16
Kokuto Line	16
Nagahara Line	16
Kagoshima Line	16
Hohi Line	16

TABLE OF CONTENTS

	<u>Page</u>
Island of Shikoku	16
South Dosan Line	16
Yosan Main Line	16
Line Between Yamada and Higashigawa	16
Island of Honshu (Main Island)	16-17
Miyazu Line	16
Godo Electric Line	16
Chuo Line	16
Tokyo-Asakawa Section	16
Oita Line	16
Itō Line	16
Yamada Line	16
Uryu Line	16
Tohoku Line	17
Joban Line	17
Hokuriku Line	17
Tokaido Line	17
San Kyu Electric	17
Joetsu Line	17
East Senzan Line	17
Uetsu Line	17
Sendai-Yamagata Line	17
Hagi Line	17
Notes and Sources	18

INDEX OF EXHIBITS

- Exhibit 1 Portal to a number 9 railway tunnel on Taiwan. Illustrative of the usual entrance to such structures throughout the Japanese Empire.
- " 2 Map of Tokaido route showing new deviation since completion of the Tanna tunnel.
- " 3 Profiles of old and new sections of Tokaido lines between Kozu and Numazu, with comparative figures for this section of the Tokaido line.
- " 4 Diagram of cross section of Tanna tunnel.
- " 5 Water coming out of drain tunnel in Tanna tunnel.
- " 6 View of entrance to Tanna tunnel illustrating difficulties encountered due to floods from underground rivers.
- " 7 Rough longitudinal diagram of Kwammon drainage tunnel and railway tunnel.
- " 8 Steel rings used in Kwammon tunnel.
- " 9 Cross section sketch of Kwammon tunnel.
- " 10 Portal of the Aoyama tunnel.
- " 11 Profile of the Aoyama tunnel.
- " 12 South portal of Kurosaki tunnel, 23 miles from Murakami on Uetsu Main Line.
- " 13 South portal to Manouchi tunnel, about 22 miles from Murakami, between Katsuki and Fuya.
- " 14 Murakami portal to Udomari tunnel between Samukawa and Katsuki on Uetsu Main Line.
- " 15 Far view of portal to one of two tunnels, Horai Nos. 1 and 2, between Kuwa and Semu Rivers on Uetsu Main Line.

3253
CHI-127

Economic Warfare Section
War Division
Department of Justice
Washington, D. C.

Confidential Report
October 27, 1943
Re: Japanese Railway Tunnels
Submitted by: Charles Layng
and Richard Babcock
Economic Warfare Section
Department of Justice
Chicago, Illinois

REPORT ON JAPANESE RAILWAY TUNNELS

Introduction

In a mountainous country such as Japan, tunnels are of frequent occurrence and there are more than 1,200 railway tunnels in the Empire (Exhibit 1). The longest of these is the Shimizu tunnel 31,890 feet. Of prime importance, however, are the Tanna tunnel, on the Tokaido main line, and the Kwammon tunnel, under the straits between Shimonoseki and Moji. These are dealt with in detail later.

In building Japanese railway tunnels, relatively little difficulty was ordinarily encountered from collapse of the walls as, usually, the tunnels are bored through rock. However, considerable difficulty has been encountered in many of the tunnels because of water, and drainage has presented a major problem in the building of practically all of the large tunnels.

The Tanna Tunnel (Note 1)

As may be seen from Exhibit 2, the Tokyo-Kobe trains formerly left the coast at Koju 50 miles out of Tokyo and rejoined it at Numazu 37 miles farther on. This section still has today long grades totaling 12 miles of 1 in 40, and serious difficulty had been experienced for many years in the operation of the principal trains and express schedules.

In view of the increasing train weights, it was decided about 25 years ago to construct an alternate line which would run from Koju to Numazu by a more southerly route, which, although only 11.7 kilometers shorter, would have a maximum grade of only 1 in 100. This scheme necessitated boring a tunnel some 5 miles long through a volcanic region, located between Atami (104.6 k.m. from Tokyo) and Numazu (126.2 k.m. from Tokyo) on the Tokaido line. The difficulties met in carrying out this work were far in excess of those estimated and led to the

expenditure of approximately 100,000,000 yen spread over a period of 15 years.

The relative profiles of the old and new lines are shown in Exhibit 3 together with the particulars of the grades and curves. Gradients within the tunnel range from 1 in 440 to 1 in 310 with a short level stretch in the center. Water leakage formed the principal trouble in boring the Tanna Tunnel, the rate of leakage at some points rising to 50 cubic feet per second. A 6-foot by 5-foot drainage tunnel running below and to one side of the main structure was constructed over much of the length. This abnormal leakage was due to the volcanic nature of the grounds, lakes forming in basins, and ancient craters percolating through to the tunnel opening.

On the score of expense, the idea of two single line tunnels was given up in favor of one large bore, a section of which is shown in Exhibit 4. The tunnel has been lined throughout with concrete.

The following are excerpts from annual reports of the government department of railways indicating the nature of the problems encountered during construction of the Tanna Tunnel:

1928

The excavation of Tanna tunnel which had been in course of construction since 1918 and noted for its hard work was still under construction. On the east section the driving of the drain tunnel on the north side which had been carried on by means of shields and pneumatic method had to be suspended for a time on February 11, 1927 on account of the collapse of sands and gushing of water, when the drain reached the point of 2 km. 790.90 m. As it was revealed that the pneumatic method was unsuited for driving such stratum and, moreover, it was judged advisable to start work after effecting cementation to prevent these obstacles, the engineers in charge planned to connect the north side drain with the bottom heading by connecting shaft in order to effect cementation from the heading of the latter and then to start driving. Thus the work was resumed on April 29, 1927 at the point of 2 km. 773.90 m. On March 31, 1928 the north side drain reached 2 km. 815.56 m. point. The total length of bricking effected during the year was from 2 km. 593.70 m. to 2 km. 701.59 m. As regards the West section work on the part beyond 2 km. 148 m. point having seriously been retarded by the gushing of water and sand slips, the driving of 4 drain tunnels, two on each side, was newly started. These, however, being again interrupted by the gushing of water accompanied by sand

slips, it was decided to start driving by pneumatic method to prevent the obstacle and by means of it. work was started on September 30, 1927 for the distance beyond 2 km. 297.73 m. on the No. 3 north side drain tunnel. By March 31, 1928, it reached the point of 2 km. 417 m., recording a progress of 119.27 m. As to the enlargement and lining for this section it was completed by ordinary method as far as 2 km. 378 m. point and the further distance was in course of progress by side bottom method. The total progress of both the east and west sections effected during the year was 141.43 m. for the top tunnel, 190.20 m. for bottom heading lining and 299.47 m. for lining together with a length of 443.79 m. of drain tunnels and by-paths. The earthwork and others on both 10 and 11 subsections, 38 km. 60.99 m. and 40 km. 133.2 m. and 40 km. 133.02 m., 41 km. 521.08 m. continued from 1925 was finished by 90 percent.

1929

Of the excavation work at the east entrance of Tanna Tunnel, the driving of the bad stratum in the neighbourhood of 2 km. 804 m. was achieved in April, 1928, by means of cementation as planned in the previous year. The stratum farther on consisted of harder rock though subjected to more amount of gushing water, and as there occurred no collapse of sands the driving of the drain tunnel carried by the ordinary method reached as far as 2 km. 974.90 m. within the year. On the other hand the drain on north side parallel to the main one was driven by the same method of excavation and reached the point of 2 km. 72 m. As regards the west section of the tunnel the north drain was excavated by the pneumatic method, the top reaching to 2 km. 516.10 m., point on June 29, 1928, while the south drain driven by means of pneumatic method reached 2 km. 645.90 m. For farther stratum the ordinary method of driving was adopted it reaching the point of km. 683 10 m. during the year. Through both North and East sections excavation recorded by the end of this year was 359.30 m. for bottom heading, 74.20 m. for lining and 916.10 m. for the rest.

1930

The heading of the east entrance of Tanna tunnel was driven to the point of 2 km. 804 m. in the previous year. The stratum farther on consisted of harder rock and as there was no fear for collapse of sands, the driving work carried on satisfactorily by the ordinary method, and reached as far as 3 km. 50 m. during the year, while the drain on north side parallel to the main one was pushed to the point of 3 km. 48 m. in August, 1929, but as it met with a dislocation at this point the work was suspended for a time, and the stratum in the neighbourhood of 3 km. 90 m. was so bad, that the preparatory work for cementation was applied. The driving on north side drain was suspended due to the bad stratum and a large amount of gushing water. Cutting and digging of this heading was completed as far as 2 km. 890 m. by the end of this year excepting a distance of 12 m. in the neighbourhood of 2 km. 728 m. Excavation work at the west entrance of the tunnel, continued by the pneumatic method from the previous year, reached to the point of 2 km. 533 and 2 km. 589 m. respectively for north and west sides within the year. Driving for farther stratum on the west side was carried on by the ordinary method and reached as far as 3 km. 480 m. before the end of this year, while the same kinds of work for the main drain reached as far as 3 km. 415 m. Cutting, digging and lining were completed to the point of 2 km. 897 m. Thus all the excavation work recorded 912 m., for bottom heading, 633 m. for lining and the total progress saw 1 km. 150 m.

1931

Tanna tunnel has the total length of 7 km. 807 m. with a double track. By the end of this year the heading reached as far as 3 km. 301 m. from the east portal and 3 km. 595 m. from the west. The cutting and lining proceeded to the point of 3 km. 61 m. from the east and 3 km. 354 m. from the west portal. The head of the drain reached as far as 3 km. 408 m. from the east and 3 km. 655 m. from the west side, and 7 km. 63 m. in the total length. The progress of the entire work as regards this tunnel was 83 per cent. leaving a distance of only 744 m. untouched. The work of boring on the east side of

this tunnel was frequently retarded due to the collapse of sand and the gushing of water, but so far it was making a fair progress until it reached a point of 3 km. 100 m. at the end of the last year, when it met with a fault which caused the work to be suspended for a time. By utilizing the drainage close by, however, the main work was resumed. At a point of 3 km. 277 m. it met once again a small fault, but by cutting again a drain it was being pushed on. Cutting and lining works for a distance of 12 m. in the neighborhood of 2 km. 728 m. were carried on by a special method. The works on the main head from the west portal which also had met with many difficulties was making a fair progress, its head reaching as far as 3 km. 591 m. and the south drain to the point of 3 km. 655 m. by June, 1930. But at this point it again met with a great fault followed by a large amount of gushing water and sand, so as to make drilling impossible.

To make matters worse the earthquake in November, 1930 caused the dislocation of the fault that occasioned a collapse of sand and practically all works to a standstill for a time, but by dint of efforts made by the Railways they were restored by the end of this year. The total work recorded during the year was 441 m. for bottom heading, 608 m. for lining and 1 km. 344 m. for drain and connection heads.

1932

. . . The boring work of Tanna tunnel proceeded to the point of 3 km. 403 m. from the east portal and 3 km. 595 m. from the west portal, while the cutting and lining works advanced as far as 31 km. 331 m. from the east portal and 3 km. 578 m. from the west portal. The head of the drain reached as far as 3 km. 479 m. from the east portal, 3 km. 655 m. from the west portal, or 7 km. 134 m. for the total. Thus the work of drain excavation left untouched at the end of the year was only 673 m. in distance. The main heading on the east side encountered a fault in the neighborhood of 3 km. 277 m. from the portal. In order to expel the gushing water out of the tunnel a drain was constructed on the south side and the work was completed as far as the said distance by June, 1931. Meanwhile the drain on the

south side became affected by another fault at a distance about 3 km. 480 m. from the portal. Thereupon altogether 4 more drains, viz. 3 on the south and 1 on the north side, had to be constructed. Attended to with cementation at a point of 3 km. 411 m. from the portal, the further excavation work on the north drain was resumed in February, 1932 and was still in course of progress by the end of the year.

For the cutting and lining work on the main tunnel in the neighborhood of 2 km. 728 m. a special method of excavation was employed on account of a peculiar nature of soil thereabout and was completed in June, 1931. As regards the excavation work on the west side which met a great fault in 1930 the work for constructing a few more drains in order to pump out the gushing water had still been in course of progress. Of these drains one in the north side was attended to with cementation, but the difficulty was not altogether overcome yet. As the ferocity of gushing water was especially remarkable in the neighborhood of 3 km. 500 m. more drains are being built now. The lining and cutting work of the main tunnel were in course of fair progress. (Exhibits 5 and 6)

1933

The excavation work of Tanna tunnel proceeded to the point of 3 km. 716 m. from the east portal and 3 km. 641 m. from west portal, while brick-laying advanced as far as 3 km. 478 m. from the east portal and 3 km. 604 m. from the west portal. The head of the drain reached the point of 3 km. 833 m. from the east portal and 3 km. 709 m. from the west portal, or 7 km. 542 m. for the total leaving only 265 m. in distance untouched. The progress of work of this tunnel was 91 per cent during the year. The heading on the east side met a few small faults in the neighborhood of 3 km. 410 m. from the portal but they were bored by a few drains constructed on the north side of the tunnel. This work made quite a successful progress that had not been recorded in the past few years. The same kind of work on the west side encountered a great fault in June, 1931, but the gushing water was controlled by a few drifts and drains which had been constructed in the previous year. As the

stratum involved a great amount of rock, another collapse occurred at the point of 3 km. 657 m. from the portal where the drain and the heading on the northside crossed each other, but by dint of the workers' effort the difficulty was passed through. The drilling work started from this heading towards the south side was steadily being pushed.

1934

. . . As regards the tunnel work at Atani what was effected during the year comprised an advancement of the main heading from both sides by 446 metres, lining by 721 metres and drainage by 458 metres, thus leaving only a trifling work for lining and drainage to be finished in the next year. The total progress of the tunnel work achieved from the beginning up to the end of the fiscal year was 99 per cent. The drainage pushed forward from the east entrance from the previous year saw a fair progress during the year. As reported in the previous year's report the same work on the west side came across with another big fault in the neighborhood of 3,650 metre distance from the portal toward the end of the previous fiscal year, but after it had been forced through the work made a fair progress and on June 19, 1933 the first heading at last came across with the heading from the east side. This auspicious success was soon followed in August by another success when the main headings from both sides met with each other and saw light. The success in forcing through the main heading after the continued work of 15 years is especially memorable as it convinces the Railways of its final success in no distant day in constructing one of the most difficult tunnels in the world.

1935

In the face of such obstacles as the presence of numerous bad strata and the frequent gushing of water, the State Railways was at last successful in completing the excavation of the Tanna tunnel in May, 1934 due to the untiring efforts on the part of all the railway employees and workmen who had devoted themselves to this difficult work. It took more than 16 years to achieve the excavation of this tunnel since the actual boring had been undertaken. After finishing the plate-laying, the erection of various

buildings and the installation of the safety appliances which were continued from the preceding year, the Numazu-Atami section was opened to business in December, 1934. By the opening of the entire Atami line the distance between Kozu and Numazu was shortened by 11.7 km. as compared with that via the old Gotemba line, bringing about thereby a revolutionary change in the transportation system of the trunk lines of the State Railways.

The Kwannon Tunnel

(Note 2)

In September 1936 work began on the Kwannon tunnel connecting Moji on the island of Kyushu and Shimonoseki on the island of Honshu. According to an FCC report of this year, the work has been completed, and the tunnel is now handling traffic under the Straits of Kyushu. The strategic importance of this new tunnel needs little comment. With the exception of whatever rail traffic may still be transported by ferry across the Kyushu Straits, this tunnel is the bottleneck of rail transport between Honshu and Kyushu.

The first step in the construction of the Kwannon tunnel was the driving of a drainage tunnel (9 ft. by 7-1/2 ft.) under the straits connecting Moji and Shimonoseki. This was done to relieve pressure on and to act as a drainage for the railway tunnel.

In Exhibit 7 the drainage tunnel is outlined in red and the apex of this tunnel may be seen to be directly under the railway tunnel. The gradient is 1 in 700 or a slope of about five feet from the apex of the drainage tunnel to either the Moji or Shimonoseki sides. At each end of this tunnel is a vertical shaft approximately 10 ft. in diameter and 150 ft. in depth. At the bottom of this shaft is a pumping arrangement and a 10 ft. sump. The water seeping from the seabed flows by gravity to the center of the railroad tunnel and then into the drainage tunnel. The water flows to the low ends of the drainage tunnel where the pumping arrangement carries it to the surface through the vertical shafts (marked X in Exhibit 7).

The railway tunnel is approximately 36 feet above the drainage tunnel. Since the drainage tunnel has only a 5 foot drop or one foot in seven hundred, it is apparent the railway tunnel is almost level. The railway tunnel 24 ft. in diameter and, including its approaches, is approximately 2 miles long. It is constructed of steel rings consisting of 14 segments (Exhibit 8). Each segment weighs approximately 3,000 pounds and is of I-beam construction with bolts through the vertical and horizontal parts. Each ring consists of 14 segments weighing in excess of 20 tons, and adds approximately 30 inches to the length of the tunnel. In the construction these segments were forced into place by super-powered hydraulic jacks. Guns were then used to force a thin mixture of cement outside the tunnel walls, in order to seal the joints. Some of the debris which entered the tunnel

through the forcing of these new ring segments was then thrown back into the bottom of the tunnel for ballast and later was to act as the bed for the railway tracks. (Exhibit 9)

The Moji entrance to the Kwannon tunnel is on the south side of the railway track near a large cement plant near Kuzuha (Kusuha). There are double tracks under the tunnel at this point. The tunnel passes under the railway tracks, according to one informant who estimates the approximate distance from the entrance to the ocean to be about 300 yards. There is no certainty as to the exact spot where the tunnel emerges on the Shimonoseki side. It is possible that the entrance is near the railway repair shop back of the Shimonoseki railway station. Inside the tunnel the cars are drawn by electric locomotives.

The Aoyama Tunnel
(Exhibit 10; Note 3).

This tunnel, which is 3,432 meters in length, is on the San Kyu electric line, a standard gauge railway 97 kilometers in length, running between Uji-Yanada and Sakurai. From Sakurai this San Kyu line operates into Osaka over the Daiki line and is of extreme importance in getting workers between points in the heavily industrialized district of Osaka.

The Aoyama tunnel was constructed by the Obayashi-Gumi Company, begun in March 1928, and completed in August 1930 at a cost of 3,000,000 yen. From the profile (Exhibit 11) of this tunnel, it will be noted that it is on a sharp grade for most of its length.

Tunnels Definitely Located
(Note 4)

Island of Hokkaido

Hakodate Main Line
(Hakodate-Asahigawa 425.1 km.)

<u>Km. from Hakodate</u>	<u>Station</u>	<u>Name of Tunnel</u>
193.3	Kutchan	Kutchan
262.9	Hariusu	Hariusu (Entrance of this tunnel sub- ject to landslides)

Island of Hokkaido (Cont'd)

Muroran Main Line

(Oshamanbe-Higashi-Muroran 77.2 km.)

<u>Km. from Oshamanbe</u>	<u>Station</u>	<u>Name of Tunnel</u>
0.0	Oshamanbe	8 tunnels having total length of 7.38 km.
10.6	Shizukari	
10.6	Shizukari	Rebunkazan and 7 other tunnels.
23.6	Rebun	

Island of Honshu (Main Island)

Tokaido Main Line

(Tokyo-Kobe 601.2 km.)

<u>Km. from Tokyo</u>	<u>Station</u>	<u>Name of Tunnel</u>
90.4	Nebukawa	Akazawa
95.8	Manazuru	
104.6	Otani	Tanna
126.2	Numazu	
170.1	Yui	Two tunnels (names unknown)
176.0	Okitsu	
515.3	Otsu	Asakayama
519.8	Yamashina	

Island of Honshu (Main Island) (Cont'd)

Tokaido Line
Yokosuka Line

(Tokyo-Yokosuka 62.4 km.)

<u>Km. from Tokyo</u>	<u>Station</u>	<u>Name of Tunnel</u>
31.8	Hodogaya	Shimizutani
40.9	Totsuka	

San Yo Main Line

(Kobe-Shimonoseki 529.3 km.)

<u>Km. from Kobe</u>	<u>Station</u>	<u>Name of Tunnel</u>
187.1	Kasaoka	Kanagasoki
194.2	Daimon	
494.9	Asa	Fukuda (1,135 meters long)
503.2	Habu	

San In Main Line

(Kyoto-Shimonoseki 679.5 km.)

<u>Km. from Kyoto</u>	<u>Station</u>	<u>Name of Tunnel</u>
10.3	Saga	Three tunnels (Names unknown)
21.8	Kameoka	
159.6	Kinosaki	Ashiya and 2 other tunnels.
167.6	Takeno	
199.5	Hanasaka	5 tunnels (Names unknown)
205.8	Iguni	

Island of Honshu (Main Island) (Cont'd)

Tohoku Main Line

(Tokyo-Aomori 736.4 km.)

<u>Km. from Ueno (Tokyo)</u>	<u>Station</u>	<u>Name of Tunnel</u>
138.1	Yaita	Haryu
142.9	Nozaki	
635.7	Kita-Takaiwa	Ichinichiichi
640.7	Shiriuchi	

Tohoku Line

Joetsu Line

(Takasaki-Nagaoka 162.6 km.)

This important line extending 162.6 kilometers between Takasaki and Miyauchi and affording difficult connections with the short line between Tokyo and Niigata is stated to have more tunnels per kilometer than any other main line in Japan, including the only two spiral tunnels in the empire. One of these is the long Shimiju (Shimidzu) tunnel, 9,702 kilometers long. Near Yubiso, 65.9 kilometers from Takasaki, four tunnels all known as the Yubiso tunnels have been located as follows: Yubiso No. 1, 1,760.2 meters; Yubiso No. 2, 425.2 meters; Yubiso No. 3, 948.0 meters; Yubiso No. 4, 1,540.9 meters.

<u>Km. from Ueno (Tokyo)</u>	<u>Station</u>	<u>Name of Tunnel</u>
225.3	Urasa	Fukuyama
233.6	Koide	

TOHOKU Line

Joban Line

(Tokyo-Iwawuna 345.3 km.)

<u>Km. from Ueno (Tokyo)</u>	<u>Station</u>	<u>Name of Tunnel</u>
203.7	Yunoto	Keiseizan
207.2	Tsuzura	

Island of Honshu (Main Island) (Cont'd)

Kwansai Main Line

(Nagoya-Minatomachi 175.1 km.)

<u>Km. from Nagoya</u>	<u>Station</u>	<u>Name of Tunnel</u>
101.8	Shinagahara	Shinagahara
108.8	Okawara	
149.3	Oji	Kamenose
154.0	Kawachi-Katakami	

Chuo Main Line

(Tokyo-Shiojiri-Nagoya 409.9 km.)

<u>Km. from Tidanachi (Tokyo)</u>	<u>Station</u>	<u>Name of Tunnel</u>
58.7	Yose	1. Hashizawa 2. Amayawa
65.9	Uenohara	
248.1	Niekawa	Gongen
252.8	Kiso-Hirasawa	

Chuo Line

Shinonoi Line

(Shiojiri-Shinonoi 67.9 km.)

<u>Km. from Shiojiri</u>	<u>Station</u>	<u>Name of Tunnel</u>
28.7	Akashina	Sirasaka
38.4	Nishijo	

Island of Honshu (Main Island) (Cont'd)

Hokuriku Main Line

(Maibara-Naoetsu 366.5 km.)

<u>Km. from Maibara</u>	<u>Station</u>	<u>Name of Tunnel</u>
31.7	Yanagase	Yanagase
74.9	Imajo	Yuno
82.1	Sabanami	
313.3	Oyashirazu	Fukaya
318.6	Oni	

Shin-Etsu Main Line

(Takasaki-Niigata 328.9)

<u>Km. from Takasaki</u>	<u>Station</u>	<u>Name of Tunnel</u>
29.7	Yokogawa	26 tunnels
40.9	Karuizawa	

Uetsu Main Line

(Niitsu-Akita 271.7 km.)

<u>Km. from Niitsu</u>	<u>Station</u>	<u>Name of Tunnel</u>
87.5	Echigo-Kangawa	Byobuiwa
-	Sanukawa	Udomari tunnel (1095 ft.) Less than 35 km. from Murakami (Exhibit 14.)
-	Katsuki	
-	Katsuki	Manouchi Tunnel (313 ft.) about 35 km. from Murakami. (Exhibit 13)
-	Fuya	
-	Fuya	Kurosaki Tunnel (211 ft.) about 40 km. from Murakami, which is 59. km. from Niitsu (Exhibit 12.)
-	Nezumi-Ga-Seki	

Island of Honshu (Main Island) (Cont'd)

Ban-Etsu West Line

(Koriyama-Niitsu 176.3 km.)

<u>Km. from Koriyama</u>	<u>Station</u>	<u>Name of Tunnel</u>
81.9	Kitakata	Keitoku
106.9	Nozawa	

O-U Main Line

(Fukushima-Aomori 487.4 km.)

<u>Km. from Fukushima</u>	<u>Station</u>	<u>Name of Tunnel</u>
22.0	Itaya	2 tunnels (Names unknown)
26.1	Toge	
268.3	Mineyoshigawa	Mineyama
274.8	Ugo-Sakai	
419.4	Jimba	2 Yatate Tunnels
430.1	Ikarigaseki	

Tunnels Not Definitely Located

Among the tunnels that could not be definitely located by distance in kilometers from a given point on maps available here, but which are referred to in reports of the chief engineer of the Imperial Government Railways, are the following:

	<u>Island of Hokkaido</u>	
Sekihoku Line	-	Zyomon (Jomon) Tunnel.
Nemuro Line	-	Karikachi tunnel. Niinai tunnel.
Ishikita Line	-	Ishikita tunnel (4,329 meters long)
Muroran Main Line	-	Fushikobetsu Tunnel.

Island of Kyushu

Kokuto Line	-	Shuzan tunnel Karikawa tunnel (Both of these are quite long)
Nagahara Line	-	Hiyamizu tunnel (The longest tunnel on Kyushu Island, situated near Harada)
Kagoshima Line	-	Samaya tunnel
Hohi Line	-	Saka-No-Ue Tunnel (2.28 km. long)

Island of Shikoku

South Dosan Line	-	Hokisan tunnel (1 km. 254.1 m. long). Between Azunagawa and Kokunatani.
Yosan Main Line	-	Inohama Tunnel (3,845 meters long).
Line between Yanada and Higashigawa	-	16 tunnels

Island of Honshu (Main Island)

Miyazu Line	-	Shiroyama Tunnel
Godo Electric Line	-	Tunnel between Yamada and Futani
Chuo Line	-	Kaburigi tunnel
Tokyo-Asakawa Section	-	Sasako tunnel (4,656 meters long). Tunnel between Ichigaya and Shinanomachi
Oita Line (Branches off the Hokuriko line at Itoigawa)	-	Ono tunnel (between Ono and Noshiro)
Ito Line (Runs from Atani on the Tokaido line to Ito)	-	Usami tunnel (2 km. 920 m. long between Usami and Hazu)
Yamada Line (Morioka to the east coast)	-	2 tunnels between Orito and Asuka.
Uryu Line	-	Horokanai tunnel. Between Takatori and Horokanai.

Island of Honshu (Main Island) Cont'd

Tohoku Line	-	Horisaka tunnel Tsurihama tunnel Tatsugamoni tunnel Kanayama tunnel
Joban Line	-	Kanayama tunnel
Hokuriku Line	-	Kurikara tunnel Funasaka tunnel
Tokaido Line	-	Izumigoe tunnel
San Kyu Electric	-	Aoyama tunnel (single track, standard gauge, 3,432 meters long) and 16 other tunnels.
Joetsu Line	-	Shinizu tunnel (9,702 meters long)
East Senzan Line	-	Senzan tunnel near Okushin Kawa
Uetsu Line	-	Ohwatasi tunnel. Longest (1.44 km.) on the route via Ugo and Honjo. Horai tunnels, Nos. 1 and 2. 122 and 171 feet long respectively. Between Kuwa and Senu Rivers, about 15 miles from Murakami (Exhibit 15).
Sendai-Yamagata Line	-	Senyama tunnel (5.36 km. long)
Hagi Line	--	Ohkari tunnel (2.22 km.), longest on the line. Hotokezaka tunnel.

NOTES AND SOURCES

No.

- 1 The Railway Gazette, March 30, 1934, page 541.
- 2 Confidential Report, February 22, 1943, on
Kwanmon Under-Sea Railway Tunnel Connecting
Shimonoseki, Honshu Island, and Moki, Kyushu
Island.

John A. Ebb
Antitrust Division
Department of Justice
Denver, Colorado
- 3 Reports on Far Eastern Transportation, #6.
The San-Kyu Electric Railway

Charles Layng
Economic Warfare Section
Department of Justice
Chicago, Illinois
June 16, 1943
- 4 Large majority of the tunnels listed were found in
Japanese Government Railways, Annual Reports,
1928-1937.

More detailed information on particular tunnels
will be included in supplementary report based
on translation of certain Japanese language
engineering and railway bulletins.
- 5 Japanese Government Railways, Time Table 1933.
Kilometer distances were obtained from this
table.

3258
NY- 221

~~Copy~~ 5417/26
COPY NO. 19
CONFIDENTIAL

DEPARTMENT OF JUSTICE
WAR DIVISION
ECONOMIC WARFARE SECTION

REPORT ON

KAWASAKI ZOSENJO (KAWASAKI DOCKYARD), KOBE

Submitted by: Leslie H. Standlee
War Division
Department of Justice
New York, N. Y.

TABLE OF CONTENTS

	<u>Pages</u>
I. Introduction	i to 11
II. Steel Mill Purchases by Kawasaki Zosenjo	1 " 4
A. 3-High Blooming and Billet Mill	1
1. Development of the Inquiry	1
2. Specifications	2
3. Placement of the Order	2
B. 10" Wire Rod Mill	2
1. Development of the Inquiry	2
2. Placement of the Order	3
3. Additional Equipment	3
C. 20", 18" and 12" Bar and Merchant Mill	4
D. Small and Medium Rod Mill	4
III. Machinery Orders and Inquiries for Kawasaki Zosenjo	5 to 19
A. Orders and Inquiries	6 " 14
1. Mitsubishi	6
2. Mitsui	6
3. Ataka	8
4. Okura	10
5. Imperial Export	14
B. Recapitulation of Orders and Inquiries	15 to 18
1. Lathes	15
2. Grinding Machines	15
3. Boring Machines	16
4. Milling Machines	16
5. Presses	17
6. Steel Plates and Bars, etc.	17
7. Miscellaneous Machines	17
8. Additional Equipment	18
C. Purchases as Indicated in Confidential Report of Mitsubishi	19

	<u>Pages</u>
Footnotes	a to c.
Footnotes to Part II	a
Footnotes to Part III	b
Exhibits	(1) to (7)
A - Quotation for 3-High Blooming and Billet Mill	(1)
B - Proposal for Wire Rod Mill	(2)
C - Quotation for Roll Equipment, Guides and Repeaters	(5)
D - Quotation for Billet Heating Furnace	(6)
E - Summary of Proposal for Bar and Merchant Mill	(7)

Economic Warfare Section
War Division
Department of Justice
Washington, D. C.

Confidential Report
October 22, 1943 (Report No. 221)
Re: Kawasaki Zosenjo (Kawasaki
Dockyard), Kobe.
Submitted by: Leslie H. Standlea
War Division
Department of Justice
New York, N. Y.

REPORT ON

KAWASAKI ZOSENJO (KAWASAKI DOCKYARD), KOBE

I - INTRODUCTION

Kawasaki Zosenjo (Kawasaki Dockyard) Kobe, is one of the more important producers of heavy marine and diesel engines, ships, tanks, armor plate and fabricated steel in Japan. It is a subsidiary of Kawasaki Jukogyo (Kawasaki heavy industry) the great Japanese industrial enterprise that includes the manufacture of iron and steel, aircraft, ships, automobiles and locomotives⁽¹⁾

Kawasaki Dockyard between January 1, 1937 and December 7, 1941 purchased a considerable number of machine tools and machinery in the United States. It also made a number of inquiries in the United States for various types of steel mills, but purchased these mills in Japan from Japanese companies. This report covers those purchasing activities and inquiries as shown in the files of U. S. Japanese trading companies, Mitsubishi Shoji Kaisha, Mitsui & Co., Ltd., Ataka & Co., Ltd., Okura & Co., Ltd., and the Imperial Export Company. The files of these companies (excepting the Imperial Export files) are now in the possession of the Alien Property Custodian and are kept in a warehouse at 27 Cliff Street, New York, N.Y. This report is one of a series of studies on the Kawasaki enterprises, resulting from an examination of these files (2) (3)

With respect to steel mills, Kawasaki made inquiries in the U. S. for blooming, billet, wire rod, bar and merchant mills. Although no orders were placed in the U. S., Kawasaki probably secured in 1939 or 1940 a 3-high blooming and billet mill from the Tokyo Roll Co. in Japan, a 10" wire rod mill from Shibaura-United of Japan, and a medium and small rod mill from other Japanese companies. The files indicated that the mills were to be delivered to the Kawasaki Dockyard. However, some or all of the mills may have been shipped to one of the Kawasaki steel plants, subsidiaries of the Kawasaki Heavy Industry, located at Kobe, Fukui ku, Wakinohama 2-chome, 14, or at Kobe Hayashida ku, Higashishiriike, 1-chome.⁽¹⁾ It is possible

-
- (1) "A Directory of Certain Japanese Industrial Concerns", dated August, 1943, by John Williams of O.E.W.
 - (2) Kawasaki Kokuki (Kawasaki Aircraft), Kobe. Report by L. H. Standlea, #210, New York, War Division, Department of Justice.
Kawasaki Sharyo (Kawasaki Transport-Automotive Works), Kobe.
Report by L. H. Standlea, #211, New York, War Division, Department of Justice.
 - (3) According to "A Directory of Certain Japanese Industrial Concerns" dated August, 1943, by John Williams of O.E.W., Kawasaki Zosenjo is a subsidiary of Kawasaki Heavy Industry which was established in 1896 as the Kawasaki Dockyard (Zosenjo). Kawasaki Heavy Industry is said to include the following activities:

that the blooming mill did go to the Dockyard because a letter dated November 24, 1938 in the Imperial Export Company files states that "Kawasaki Dockyards have been approved by the army to supply finished forgings to all manufacturers of aero engines."

As to machine tools and machinery, Kawasaki Dockyard purchased and made inquiries for equipment in the United States designed to manufacture "submarines, turbine engines, diesel engines, tanks, bridges, girders, etc."(1) Between 1937 and Pearl Harbor Kawasaki Dockyard placed orders in the United States as follows:

Mitsubishi	\$18,840.92
Mitsui	21,732.94
Ataka	84,450.55
Okura	161,656.10
Imperial Export	729.85
Total	<u>287,410.36</u>

The above two activities of Kawasaki Dockyard are discussed in detail in the sections that follow.

cont'd.

1. Shipbuilding and engineering. Plant at Kobe: Soto-ku, Higashikawasaki cho, 2 chome 14.
2. Steel plant and sheet milling (including cold rolled alloys) plant at Kobe: Fukiai ku, Wakinohama cho, 3 chome.
3. Steel manufacturing (steel forgings, alloy steel castings and forgings). Plant at Kobe: Hayashida ku, Higashishiriike, 1 chome.
4. Automobile manufacturing (automobiles, trucks and parts for locomotives). Plant at Kobe: Known as Sharyo Works.
5. Aircraft manufacturing: There are four aircraft plants all located at or near Kobe. They are engaged in the manufacture of airplanes, airplane parts and engines.

II - STEEL MILL PURCHASES BY KAWASAKI ZOSENJO

The files indicate that Kawasaki, in 1939, purchased a 3-high blooming and billet mill from The Tokyo Roll Co. of Japan; a 10" wire rod mill from Shibaura-United; and a medium and small rod mill from unknown Japanese makers. They also made inquiries for bar and merchant mills. This section relates the development of the steel mill purchases for Kawasaki as shown in Mitsui Misc. Folder #2136.

A. 3-High Blooming and Billet Mill

1. Development of the Inquiry

United Engineering & Foundry Co. of Pittsburgh, Pa. received an inquiry for a blooming mill from Kawasaki Zosenjo, Kobe, July, 1939, and asked Mitsui, New York to cable Mitsui, Tokyo to find out if the inquiry was genuine. Mitsui, Tokyo answered on July 6th that Kawasaki intended to buy a blooming mill having an estimated weight of 800 tons, to be made in Japan according to German design because of the difficulty in securing an exchange permit.

The Shibaura-United Co. of Japan, jointly owned by United Engineering Co. of Pittsburgh, Pa. and Shibaura Engineering Co. of Japan, wanted to quote on the blooming mill inquiry for Kawasaki, but in order to do so they were required to have the approval of United Engineering. (1) United Engineering had no objections to Shibaura-United quoting on the blooming mill even though it knew that it had no chance to secure the order. (2) United Engineering consequently sent to Mitsui, New York on July 11, 1939 a quotation for a 3-high blooming and billet mill to be transmitted to the Kawasaki Dockyard at Kobe (Exhibit A) (Drawing for 3-high blooming and billet mill in folder) Two possibilities arise:-

(a) United Engineering probably submitted the blooming and billet mill quotation in order to furnish Shibaura-United with technical information to aid its partner in the preparation of its proposal. Mitsui's cable from New York to their Tokyo office, July 21, 1939, states: "United Engineering sending suggestion (to Shibaura-United) according to usual practice." In a subsequent inquiry for a wire rod mill, United Engineering in its quotation did supply the technical data for Shibaura-United. (Section B, Exhibit B)

(b) It is possible that this quotation by United Engineering was the result of an entirely different inquiry for Kawasaki than the one for the blooming mill. Such an inquiry could have been

transmitted by Buente, presumably an employee or representative of United Engineering in Japan (3), to United Engineering without there being any evidence of it in the file.

2. Specifications

The Japanese did not send any specifications for the blooming and billet mill, but the type of equipment desired can be deduced from United Engineering's quotation of July 11, 1939 (Exhibit A). The first paragraph states that the blooming and billet mill was intended to do the following:

"for rolling mild steel ingots 340 mm. square, weighing approximately 900 kg. (13.4" x 40" long, 2000 #) into 90 to 130 mm. squares (3.54" to 5.12") and 150 to 200 mm. rounds (5.91" to 7.87"), the mill to have a capacity to produce 180,000 metric tons annually in 300 operating days of 22 hours, we offer for your consideration, equipment as shown on attached drawing PR-14532-H (in folder)".

3. Placement of the Order

The Tokyo Roll Co. received the order for the blooming and billet mill instead of Shibaura-United because Shibaura-United was unable to offer rapid delivery. (4) Kawasaki placed the order for the blooming and billet mill with the Tokyo Roll Co. of Japan according to a letter from Mitsui, New York to United Engineering, dated August 12, 1939:

"We are sorry to report to you that according to a cablegram we received from our Tokyo office, Kawasaki Dockyard placed order for blooming and billet mill with the Tokyo Roll Co."

B. 10" Wire Rod Mill

The order for the wire rod mill for Kawasaki Dockyard was placed with Shibaura-United on December 1, 1939. The capacity of the mill was to be 30,000 tons per year, price ¥632,700, delivery date 15 months, to be built according to detailed specifications provided by United Engineering Co. (Proposal #9758, Revised September 5, 1939, Exhibit B, drawing of general plan for wire rod mill PR-14618-H in folder).

1. Development of the Inquiry

In order to have United Engineering quote for the wire rod mill, Mitsui, Tokyo, August 12, 1939, cabled the specifications

to New York as follows:

"BILLETS 57 MM SQUARE RODS (S) DIAMETER IN MILLIMETERS
5-12 ANNUAL PRODUCTION 30,000 TONS LOCATE (time) REFER
TO DRAWINGS SENT BY BUENTE (S) JUNE 12th WHEN CAN YOU
SEND ESTIMATE TEL PRICE CIF NET WEIGHT AND TERM OF
SHIPMENT WHAT DOES IT INCLUDE."

United Engineering mailed its quotation for the rod mill on August 23, 1939 and a revised quotation for the wire rod mill was mailed on September 5, 1939 (Exhibit B.)

2. Placement of the Order

The order for the wire rod mill was placed by Osaka Dockyard with Shibaura-United on December 1, 1939 for \$432,000 and a shipping date of 15 months. United Engineering's proposal of August 23, 1939, it is believed, was used by Shibaura-United in the preparation of its own proposal. It is probable that the main purpose of United Engineering's quotation was to supply this information to Shibaura-United and not to secure an order for United Engineering. For instance:

(a) Mitsui, New York, on receiving the quotation by United Engineering of August 23, 1939, for the wire rod mill, cabled a summary of the quotation to Mitsui, Tokyo. In a covering letter of August 24, 1939, Mitsui, New York stated that they had cabled "details of the proposal so that Shibaura-United will be able to make their quotation."

(b) It was necessary for Shibaura-United's estimate for the wire rod mill to wait until the detailed specifications arrived from New York about September 10, 1939. (5)

3. Additional Equipment

Shibaura-United, after receiving the order for the 10" wire rod mill, desired to have the rolls and the furnace design for the rod mill supplied by United Engineering. Due to exchange permit difficulties the plan did not develop and it became necessary for the equipment to be manufactured in Japan.

(a) Rolls for the Rod Mill - United Engineering was to "QUOTE ALSO PASS AND TWIST GUIDE DESIGN PRINT FOR ROLLING FROM 3" x 3" BILLETS TO ROD 0.216 INCHES IN 19 PASS. FOR YOUR REFERENCE SKF BEARING WILL BE OBTAINED IN JAPAN." (6) United Engineering quoted: for turning the rolls, price \$3,250; for

complete designing roll passes, price \$880.; for engineering work only including detailed drawings for all necessary guides and repeaters, price \$10,030.

Shibaura-United actually planned to get the rolls made in Japan and "cut the caliber by United roll pass design" (7) and probably did so because of exchange permit difficulties.

(b) Furnace for the Rod Mill - Shibaura-United planned to have the furnace for the rod mill made in Japan according to American design. Accordingly United Engineering, January 20, 1940, submitted a quotation from the Rust Furnace Co. of Pittsburgh for drawings of the billet reheating furnace to cost \$7,500. (Exhibit D). The Rust Co. quoted on a furnace having a capacity of heating billets from $2\frac{1}{4}$ " x $2\frac{1}{4}$ " to 3" x 3", 15 feet long at the rate of 10 tons per hour. Due to difficulty in securing the exchange permit for drawings of the Rust Furnace Co., Kawasaki Dockyard decided to build its own furnace by their own design (8)

C. 20", 18" and 12" Bar and Merchant Mill (Exhibit E)

A 20", 18" and 12" bar and merchant mill quotation was mailed by United Engineering, August 23, 1939, to Mitsui, New York, for the Kawasaki Dockyard. These mills were to have a total production of 150,000 metric tons per year and were to cost \$1,137,000. (United Engineering drawing of the general plan for a bar and merchant mill in the folder). This quotation evidently was a follow-up on the blooming and billet mill quotation of July 11, 1939 (See Section A). There is no further reference to this quotation in the file.

D. Small and Medium Rod Mill

Kawasaki had purchased a medium rod mill and a small rod mill (probably from Japanese makers) (9). This is the only reference in the file about these plans.

Economic Warfare Section
Department of Justice

Confidential Report
October 22, 1943 (Report No. 221)
Submitted by: Leslie H. Standlea

III - MACHINERY ORDERS AND INQUIRIES FOR KAWASAKI ZOSENJO.

Kawasaki purchased \$287,410.36 worth of machinery, engineering services, etc., in the United States between January 1, 1937 and December 7, 1941. These machine tools were designed to manufacture such items as submarines, engines, tanks, etc. The following orders and inquiries of Kawasaki Dockyard are tabulated separately on pages 6 to 14 by Japanese trading companies. The tabulations show: the file number of the order or inquiry (from which any folder may be located), the date of the order or inquiry, the name of the American manufacturer producing the machinery, the quantity of machines purchased on each order, a description of the machine, and the price of the machine.

The symbol "S" indicates that the order was shipped in its entirety to the Kawasaki Dockyard at Kobe. The symbol "C" indicates that the order was cancelled in its entirety. "S" and "C" do not appear in the inquiry sections, because inquiries were never shipped.

Pages 15 to 18 consist of a recapitulation of the orders and inquiries. This recapitulation is arranged according to the types of machine tools, i.e., grinding machines, milling machines, lathes, boring machines, etc.

A. - ORDERS AND INQUIRIES

MITSUBISHI

ORDERS

Order No.	Date	Manufacturer	No.	Product	Price
07484	3/10/37	Pennsylvania Pump	1	Class DE-2, 30"x 18"x21" motor driven air com- pressor	13,030.00 S
07571	4/6/37	Lodge & Shipley	1	27"x12' engine lathe	5,532.64 S
A	4/6/37	Union Mfg.		4-jaw independent chuck (Note 1)	187.20 S
07928	9/20/37	Ingersoll	2	sets HSS blades #039050	91.08 S
			2	sets HSS blades #039051	

INQUIRIES

Inquiry No.	Date	Manufacturer	No.	Product	Price
NYO-366	1/26/38	Pennsylvania Pump	2	DCE 30"x18"x21" class air compressor	
NY 561	10/2/36	Niles-Bennet-Pond	1	Quartering machine to be used on locomotive driving wheels for quartering and for crankpin turning and grinding (Note 2)	
NY 2390	9/30/39	Bilgram	1	16" bevel gear cutter	
NY 2427	9/19/39	Mesta	1	6,000 ton hydraulic forge press \$729,000.00 (Note 3)	

MITSUBI

ORDERS

Order No.	Date	Manufacturer	No.	Product	Price
3185 E.O. 1915	11/28/39	Kearney & Trecker	1	#1230 Simplex mill- ing machine	4,717.58 C
3539 E.O. 5871	2/23/37	I. G. E.	300	lbs. type W-22 weld- ing electrodes for mild steel	25.00 S

Order No.	Date	Manufacturer	No.	Product	Price
3543 E.O. 2543	2/19/40	Warner & Swasey	1	#5 12-speed all geared head Universal turret lathe	5,536.50 C
3647 E.O. 2407	9/10/37	Kearney & Trecker	1	#3K plain milling machine	5,685.31 S
3971 E.O. 2263	4/30/38	Kearney & Trecker	1	#3K plain milling machine	5,768.55 S

INQUIRIES

Inquiry No.	Date	Manufacturer	No.	Product
OE-1232	4/20/39		6	pcs. rough turned forged steel crankshafts for use with 1200 and 1500 H. P. marine diesel engines. (Note 4)
TE-8100	11/8/40	John Bliss & Co.	4 4	sets marine chronometers 7" sextants for marine use \$2,343.00
TE-12002	5/15/40		374	pcs. ball bearings similar to those of S.K.F.
TE-12011	10/23/40		811	pcs. S.K.F. ball bearings
MF-2136	7/6/39	United Engineering & Foundry Co. Rust Furnace Co. United Engineering & Foundry Co.		10" wire rod mill for billet 57 mm. sq. Billet heating furnace 800 ton blooming mill with equipment for rolling mild steel ingots 340 mm. sq. to 90 to 130 mm. sq. - capacity 180,000 tons annually
MF-2177	11/24/39	United Engineering & Foundry Co.		2,000 ton forging press (Note 5)
MF-3696	3/23/40	Norton	1	Model D 20x192" plain cylindrical grinding machine
MF-3717	4/25/38	Bullard	2	16" 6-spindle type "D" and 16" 8-spindle type "D" automatic lathes

ATAKA

ORDERS (Note 6)

Order No.	Date	Manufacturer	No.	Product	Price
4976	1/11/37	Brown & Sharpe	2	#5B Hi-speed plain milling machine	8,122.50
5010	2/3/37	Heald	1	#25-A 16" rotary sur-face grinding machine	8,535.04
			1	#50 cylinder grinding machine	
5017	2/4/37	Heald	1	#75A internal grinding machine	2,834.12
5036	2/15/37	Rivett	1	#104 internal grinding machine	1,877.93
5092	3/15/37	Gleason	25	pcs. HSS roughing tools for 12" straight bevel gear generator	472.73
			25	pcs. finishing tools for above	
5126 revised	3/27/37	Gleason	1	12" straight bevel gear generator	7,805.70
5130	3/30/37	Rivett		Grinding wheels and endless belts to be used on #104 internal grinding machine	29.32
5160	4/16/37	Brown & Sharpe	1	#2 light type vertical spindle milling machine	2,565.00
5161	4/16/37	Brown & Sharpe	2	#2 Universal grinding machine	5,942.25
5162	4/16/37	Brown & Sharpe	3	New Type #2B standard plain milling machine	8,656.28
5188 ADD	8/17/37	Brown & Sharpe	4	attachments for #2 vertical spindle milling machine	743.85
5187 ADD	7/29/37	Brown & Sharpe	1	#12 Universal milling attachment for #2A Universal milling machine	363.38

Order No.	Date	Manufacturer	No.	Product	Price
5193	4/30/37	Brown & Sharpe	3	Spare parts for open #2 B hi-speed plain milling machine	
5195	4/30/37	Brown & Sharpe		Spare parts for open #3B standard plain milling machine #1769	
5210	5/10/37	Heald	2	#172 gap internal grinding machine for work on connecting rods with motors and controls	11,597.85
5222	5/18/37	Heald	1	#172 gap internal grinding machine with motor	5,798.93
5263	6/24/37	Brown & Sharpe	2	sets 10" Universal spiral index centers trunion type for #2B HS milling machine	875.52
5277	7/20/37	Rivett	2	#104 internal grinding machine with equipment	3,775.43
5317	8/26/37	Brown & Sharpe	1	#3B plain milling machine standard type with 12" trunion type universal spiral index center head stock and footstock.	4,558.12
5359	9/20/37	Rivett	1	#112 internal grinder with equipment and motor	2,833.03
5380	9/14/37	Brown & Sharpe	2	#O.B. plain milling machine with six attachments	4,907.70
5390	9/30/37	Heald	1	#50 cylinder grinding machine with standard equipment, motor and controls	5,684.58
5391	9/20/37	Heald	1	#22 8" rotary surface grinding machine with standard equipment	3,079.15

OKURA

Order No.	Date	Manufacturer	No.	Product	Price
11113	12/11/36	Engineering & Research Corp.	1	set Erco sheet metal former model HD complete with electric motor	1,250.00
11133	2/2/37	Fairchild	1	set additional attachments for Ranger V-770-SG engine	250.75
			3	sets engine model SGV-700-A-1 with electric starter and fuel pump	16,645.15
11312	4/22/37	U.S. Steel	150	pcs. 1/4"x6'x6"x30' sheared mild steel plates	9,550.86
11313	4/22/37	U.S. Steel	120	pcs. 1/4"x6'6"x30' sheared mild steel plates	7,693.37
11315	4/26/37	Bethlehem Steel	167	pcs. 46mm. x 4000mm.	2,129.49
			142	pcs. 54mm. x 4000mm.	S
			64	pcs. 58mm. x 4000mm. steel hexagonal bars	
11329	5/4/37	U.S. Steel	767	pcs. mild steel plates	61,135.28
11338	5/8/37	U.S. Steel	108	pcs. mild steel plates	11,839.60
11349	5/11/37	U.S. Steel	28	pcs. mild steel plates	2,398.94
11350	5/11/37	U.S. Steel	169	pcs. mild steel plates strength 41/50 kg.	6,089.67
11379	5/24/37	Bethlehem Steel	2,205	pcs. steel angles for locomotive	10,537.69
11400	6/22/37	Bethlehem Steel	140	pcs. 3"x1 1/2"x25'	2,004.22
			100	pcs. 2"x1"x25' half round bars #23	S
11401	6/22/37	Bethlehem Steel	430	pcs. square edge flat steel bars	4,872.24

Order No.	Date	Manufacturer	No.	Product	Price
11412	6/12/37	Fairchild	5	sets Eclipse type E-160 direct cranking electric starters with integral hand cranking gear	2,375.00 S
11424	6/22/37	Fairchild	2	sets Eclipse type E-160 direct cranking electric starters	1,308.80 S
			8	sets hand cranking gear integral starter equipment.	
11437	6/29/37	Steel Products	1	set 5-3/4" bore x 5-3/4" stroke hi- speed single cylinder test engine with standard equipment	9,300.00 S
11577	12/23/37	Cambridge Instrument	1	Aero mixture indicator for single engine aero- plane, complete	178.50 S
12132	12/7/39	Sellers	1	set #05-D drill grinders	196.53 S
12151		Fitchburg	2	Straight spline grinders	11,900.00 S

INQUIRIES

Inquiry No.	Date	Manufacturer	No.	Product
22560	6/23/37		1	1½ ton drop hammer and 1½ ton air hammer (Note 7)
22678	6/17/37	Eric Foundry	1	2-ton motor driven drop hammer
22695	6/9/37		1	Rivet making machine of standard capacity, making rivets automatically from rolled wire 3/8" without being heated

Inquiry Co.	Date	Manufacturer	No.	Product	Price
22902	12/12/38		400	Cast steel driving wheel centers for locomotives (Note 8)	
23164-5	1/27/39	Mesta	1	5000 ton hydraulic forging press	
			1	1000 ton hydraulic forging press fixed anvil	
			1	1000 ton hydraulic forging press movable anvil (Drawing)	
23215	4/22/39		1	Set Lucas 16A Rebuilt Blanchard automatic surface grinder and Simmons 36"x12' rebuilt Niles Bennet Pond extra heavy duty planer	
23228-A	9/22/39	LeBlond	1	set gun boring machine (42"x42' heavy duty plain boring lathe)	
23234	5/5/39		1	Rebuilt motor driven lathe (distance between center 12000 mm)	
			2	Rebuilt motor driven lathe (distance between center 5500 mm)	
23242	1/9/39	Sellers	2	drill grinders (Nos. 20D & 30W)	
23248	5/27/39	LeBlond	1	Set ingot turning lathe for hexagonal and octogonal special steel ingots	
23252	6/1/39	Gould & Eberhardt Gould & Eberhardt	3	16" independent shaper (Rebuilt)	
			4	24" independent shaper (Rebuilt)	
			1	60"x60"x30' double housing planer (Rebuilt)	
		Keller	1	#E5 die sinker (Rebuilt)	
		Barber Coleman	1	#3 automatic hob sharpening machine (Rebuilt)	
		Foster	6	#5 geared head turret lathe (Rebuilt)	
		Jones & Lamson	3	4"x24" turret chucking lathe (Rebuilt)	
		Jones & Lamson	3	3"x36" turret chucking lathe (Rebuilt)	
		Bardons & Oliver	6	Universal turret lathe (Rebuilt)	

Inquiry No.	Date	Manufacturer	No.	Product	Price
23256	6/19/39	Various firms	1	set crank pin grinder (distance between centers 1000 mm. throw of crank 140 mm.)	
			1	set plano miller (cutter face to cutter face 800 mm.)	
			7	Crank pin lathes (distance between centers 1000 mm. throw of crank 140 mm.)	
			30	Face lathe (between centers 36" center height 8, 6, and 10")	
			1	Hall Planetary Milling machine for differential gear box.	
23278	6/12/39	Standard Diesel Eng.	3	sets hydraulic dynamometers	
23303	9/6/39	Watson & Stielman	3	800 ton pure hydraulic forging press with electrical equipment (Note 9)	
23353	9/12/39		1	2000 ton hydraulic forging press of 4 columns with accumulator, by-pass apparatus, pressure pumps, reducing gear, and air compressor	
23431	12/13/39	Sellers	1	5" table type horizontal boring drill and milling machine with 60"x72" revolving table (Note 10)	
23731	6/14/40		1	set tripan boring machine (Note 11)	
23893	11/18/40		178,466	kgs. carbon steel and chrome nickel steel materials	
III-8	3/5/37	Breeze Corp.		Coffman engine starter for aero engine (Cartridge type)	
VII-4	8/30/40	Cincinnati Mill	9	6"x18" plain grinder	
			7	6"x30" plain grinder	
			3	14"x36" plain self contained grinder	

NEW YORK, BERLIN & LONDON INQUIRIES (Note 12)

Inquiry No.	Date	Manufacturer	No.	Product	Price
B2616	6/25/37	Knopp	1	Complete set automatic frame ring bending machine	
B2801	5/3/39		1	2000 ton hydraulic forging machine press & etc.	
B2842	8/39		1	Complete 1000 ton hydraulic frame press	
B2885	11/40		230	pcs. of case hardening steel round bars	
B2970	8/41		1	Strip plate mill plant	
L3486	6/11/37		1	Indicating and recording apparatus	
NY 4387	11/19/37		1	set Erco sheet metal former model H.D.	
NY 4789	5/27/39		1	set of 6 head automatic sealing machine	
NY 5018	5/40		1	"Tripen" boring machine	

IMPERIAL EXPORT COMPANY

ORDERS

Order No.	Date	Manufacturer	No.	Product	Price
12/426	7/26/37	Gallmeyer & Livingston	1	Drill grinder	349.60 S
12/512	12/17/37	Shore Instrument	1	Model B monotron set	380.25 S

B. - - RECAPITULATION OF KAWASAKI ZOSENJO ORDERS AND INQUIRIES

LATHES

ORDERS

- 1 Lodge & Shipley 27"x12' engine lathe
- 1 Warner & Swasey #5 12-speed all geared head Universal turret lathe and parts

INQUIRIES

- 1 set ingot turning lathe
- 2 Bullard 16" 6-spindle type "D" and 16" 8-spindle type "D" auto-automatic lathes
- 3 Motor driven lathes
- 7 sets crankpin lathes (between center 1000 mm.)
- 30 sets face lathes (between center 36")
- 6 Foster #5 turret lathes (Rebuilt)
- 6 Bardons & Oliver #3 Universal turret lathes (Rebuilt)
- 3 Jones & Lamson 3"x36" turret chucking lathe (Rebuilt)
- 3 " " " 4"x24" " " " " " "

TOTALS: Orders: 2
Inquiries: 61

GRINDING MACHINES

ORDERS

- 2 Heald #50 cylinder grinding machines
- 1 Sellers #05-D drill grinding machine
- 1 Gallmeyer & Livingston drill grinding machine
- 1 Heald #75A internal grinding machine
- 1 Rivett #112 internal grinding machine with equipment and motor including type 106-4A ball bearing grinding wheel spindle.
- 3 Heald #172 gauge internal grinding machine
- 3 Rivett #104 internal grinding machine
- 1 Heald #22 8" rotary surface grinding machine with standard equipment
- 1 Heald #25A 16" rotary surface grinding machine
- 2 Brown & Sharpe #2 Universal grinding machines with motors

INQUIRIES

- 1 Norton 20x192" model D plain cylindrical grinding machine
- 1 Crankpin grinding machine (between centers 1000 mm)

- 2 Sellers drill grinders (Nos. 20D and 30W)
 1 Blanchard 16A rebuilt automatic surface grinding machine
 2 Fitchburg straight spline grinding machines
 9 Cincinnati Mill 6"x18" plain grinding machine
 7 " " 6"x30" " " "
 3 " " 14"x36" plain self grinding machine

TOTALS: Orders: 17
 Inquiries: 26

BORING MACHINES

INQUIRIES

- 1 LeBlond gun boring machine
 1 Sellers 5" table type horizontal boring and drilling machine
 1 " tripan boring machine (24") 600 mm.

TOTAL: Inquiries: 3

MILLING MACHINES

ORDERS

- 1 Brown & Sharpe #3B plain milling machine, standard type
 2 " " " #0B " " "
 2 " " " #3 hi-speed plain milling machines
 3 " " " #2B New Type standard plain milling machines
 1 " " " #2 vertical milling machine
 2 Kearney & Trecker #3K plain " "
 1 " " " #1230 Simplex milling machine

INQUIRIES

- 1 set of plano milling machine (cutter fan to cutter fan 800 mm.)
 1 United Engineering & Foundry Co. 800 ton blooming mill
 1 " " " " " milling machine with 60"x72" revolving table

TOTALS: Orders: 12
 Inquiries: 3

PRESSES

INQUIRIES

- 1 United Engineering & Foundry Co. 2000 ton forging press
- 1 Mesta 600 ton forging press
- 3 Watson Stillman 800 ton pure hydraulic forging presses
- 1 Mesta 1000 ton hydraulic forging press, fixed anvil
- 1 " 1000 " " " " " , movable anvil
- 1 Watson Stillman 2000 ton hydraulic forging press of 4 columns
- 1 Mesta 5000 ton hydraulic ton forging press

TOTAL: " Inquiries: 9

STEEL PLATES AND BARS, Etc.

ORDERS

- 300 I.G.E. type W-22 CBS welding electrodes

INQUIRIES

- 178,466 kgs. carbon steel and chrome nickel steel materials
- 700 Cast steel driving wheel centers
- 1,322 Mild steel plates (U. S. Steel)
- 615 Bethlehem steel bars
- 2,205 " " angles for locomotives

MISCELLANEOUS MACHINES

ORDERS

- 1 Pennsylvania Pump & Compressor Co. Class DE-2, 30"x18"x21" motor driven air compressor
- 1 set Steel Products Co. 5-3/4" bore x 5-3/4" stroke hi-speed single cylinder test engine
- 1 set Engineering & Research Corp. Erco sheet metal former model HD
- 3 sets Fairchild engine model SGV 770-A-1
 - 1 Cambridge Instrument Co. Aero mixture indicator for single engine aeroplane, complete
 - 1 Gleason 12" straight bevel gear generator
 - 2 Fairchild hi-efficiency speed reducing gears
 - 1 Shore Instrument Co. model B monotron set
 - 1 Union Mfg. Co. 4-jaw independent chuck #264 - 28" steel body
- 7 sets Fairchild Eclipse type E-160 direct cranking electric starters
- 8 sets " starter equipment

INQUIRIES

- 1 Niles-Bennet-Pond quartering machine to be used on locomotive driving wheel
- 6 Rough turned forged steel crankshafts
- 4 sets John Bliss Co. marine chronometers
- 4 " " " sextants for marine use
- 1 1-1/2 ton drop hammer and 1-1/2 ton air hammer
- 1 Erie Foundry 2 ton motor driven drop hammer
- 1 Rivet making machine of standard capacity
- 1 Simmons 36"x36"x12' rebuilt rebuilt Niles-Bennet-Pond extra heavy duty planer
- 1 Hall Planetary milling machine for differential gear box
- 3 sets Stand Diesel Engine Co. hydraulic dynamometers
- 3 Gould & Eberhardt 16" rebuilt shapers
- 4 Gould & Eberhardt 24" " "
- 1 60"x60"x30' rebuilt planer
- 1 Keller #E5 rebuilt die sinker
- 1 Barber Coleman #3 rebuilt hob sharpening machine
- 1 Breeze Corp. Coffman engine starter for acro engine
- 2 Pennsylvania Pump & Compressor Co. type DCE 30"x18"x21" air compressor
- 1 United Engineering & Foundry Co. 10" wire rod mill for billet 59 mm.
- 1 Rust Furnace Co. furnace for billet heating mill
- 1 Bilgram 16" bevel gear cutter

Orders: 27

TOTALS: Inquiries: 39

ADDITIONAL EQUIPMENT

ORDERS

- 1 Fairchild attachment for Ranger V-770-SG engine
- 1 Brown & Sharpe #12 Universal milling attachment for #2A Universal milling machine
- 4 Brown & Sharpe attachments for #2 light type vertical milling machine
- 3 " " " spare parts for #2B hi-speed plain milling machine
- " " " " " " #3B standard plain " "
- 2 sets Ingersoll HSS blades #039050 for 5 face cutters
- 2 sets " " " #039051 " " " "
- 25 pcs. Gleason " roughing tools for 12" straight bevel gear
- 25 pcs. " finishing blades for above
- 2 sets Brown & Sharpe 10" Universal spiral centers for #2B plain HS milling machine

INQUIRIES

1158 pieces ball bearings

C. - -

PURCHASES MADE BY KAWASAKI ZOKENJO

AS INDICATED IN

THE CONFIDENTIAL REPORT, MACHINE SECTION OF MITSUBISHI

1st Half of April, 1939 #2 of 43rd period (April - September, 1939)

Maker	No.	Product	Value
Automobile Cast Metals		Front spring bracket	¥ 69,130.00
Special Cast Metals		Truck center plate filling	50,932.80
Mitsubishi Heavy Industries		Ash pan bottom door guide	75,024.00
Tanske Machine Works	1	Crane	83,700.00
Ingersoll	1	Milling machine	116,249.02
Oriental Machine Co. (Toyo Kikai)	15	Lathes	144,000.00
Special Cast Metals		Door bottom guide	71,580.00
Kumaya Ship Building	22	Cranes	120,000.00

1st Half of October, 1939 #1 of 44th period (October, 1939 - April, 1940)

Maker	No.	Product	Value
Mitsubishi Chemical Machinery Co.		"Ren" type direct iron manufacturing equipment	¥1,530,000.00
Mitsubishi Electric Co.	1	Electric equipment	240,870.00
Oriental Machine Co. (Toyo Kikai)	60	Lathes	444,556.00
Oriental Machine Co. (Toyo Kikai)		Lathes	276,240.00
Kumaya Ship Building	11	Loading equipment	60,000.00
Mitsubishi Chemical Machinery Co.		Cooler	176,000.00
Automobile Cast Metals (Jidosha Imono)		Differential bearing stoppers	194,646.00

Economic Warfare Section
Department of Justice.

Confidential Report
October 22, 1943 (Report No. 221)
Submitted by: Leslie H. Standlea

FOOTNOTES TO PART II

- (1) "Shibaura Engineering Works" Report No. 204 by Don H. Banks, War Division of the Department of Justice, New York, N. Y. See Page 26
- (2) Cable from Mitsui, New York to Mitsui, Tokyo, July 21, 1939.
- (3) Mr. Buente was a representative of the United Engineering Co. in Japan. He was frequently referred to as the man who had sent a particular inquiry from a Japanese company to United Engineering. He very likely sent inquiries to United Engineering which are not recorded in the files.
- (4) Information contained in a letter in Japanese from Mitsui, Tokyo to Mitsui, Kobe, July 15, 1939. Translation was done by Sue Sun Kim of the Office of Censorship, New York, N. Y.
- (5) Information obtained from a letter in Japanese written from the machinery department of Mitsui, Tokyo to Kobe on August 28, 1939. Translation was done by Sue Sun Kim of the Office of Censorship, New York, N. Y.
- (6) Cable from Mitsui, Tokyo to Mitsui, New York on December 5, 1939.
- (7) Letter from Mitsui, Tokyo to New York, February 3, 1940.
- (8) Letter from Mitsui, Tokyo, to New York, March 6, 1940.
- (9) Letter in Japanese of July 28, 1939 from the Mitsui machinery section at Tokyo to the machinery section at Kobe. Translation by Sue Sun Kim of the Office of Censorship, New York, N. Y.

FOOTNOTES TO PART III

- (1) Mitsubishi Order 07571
Drawing #65885 for English translating gears in folder
- (2) Mitsubishi Inquiry NY-561
Niles Bennet Pond could not quote on the quartering machine without drawings of wheel sets with cranks in place due to difference in gauge of American and Japanese railroads. Japan's gauge is 1.067 meters.
- (3) Mitsubishi Inquiry NY 2427.
Nothing developed from Mesta's proposal. However, there is in files a copy of a proposal by "Wagner" of Germany for the 6,000 ton press. It is possible that Kawasaki secured the press from "Wagner".
- (4) Mitsui Inquiry OE-1232
Japanese drawings in folder
- (5) Mitsui Inquiry MF 2177
Forging press to be purchased in Japan from Shibaura
United's Price: Yen 824,450
- (6) Ataka Orders
There are no shipping documents in the files for any Ataka Orders below 5,790. However, since all of these orders occurred during 1937 and 1938 it can be assumed that the great majority of these orders were delivered to Kawasaki Zosenjo.
- (7) Okura Inquiry 22560
Drop hammer to be purchased in Japan
- (8) Okura Inquiry 22902
Kawasaki decided to make the parts themselves at their steel works plant Kawasaki Sieko Kogyo. The locomotive parts intended for South Manchurian Railway.
- (9) Okura Inquiry 23303
Press to be used for making locomotive connecting rods.
Drawing in folder.
- (10) Okura Inquiry 23431
Negotiations for the machine were also in progress with Illies & Co., Germany.

(11) Okura Inquiry 23731

Machine intended to bore a big hole leaving a center ingot to be used for steel bar. Size of work piece 3,000 mm., boring diameter 600 mm.

(12) New York, Berlin & London Inquiries

All of the machines listed under this section were obtained from an Okura entry book entitled NEW YORK, LONDON, and BERLIN INQUIRIES. There is no further information in the files regarding these inquiries.

EXHIBIT "A"

SUMMARY OF UNITED ENGINEERING AND FOUNDRY CO. QUOTATION #758

of July 11, 1939 for a 3-HIGH BLOOMING AND BILLET MILL

for KAWASAKI DOCKYARD

SUMMARY OF QUOTATION FOR A 3-HIGH BLOOMING AND BILLET MILL

The blooming and billet mill to be used for "rolling mild steel ingots 340 mm. square, weighing approximately 900 kg. (13.4" x 13.4" x 40" long - 2000#) into 90 to 130 mm. squares (3.54" to 5.12") and 150 to 200 mm. rounds (5.91" to 7.87"), the mill to have a capacity to produce 180,000 metric tons annually in 300 operating days of 22 hours." (Drawing PR-14532-H in folder)

United Engineering quoted Kawasaki Dockyard a 3-high blooming mill 30" x 80" with a bed plate 12', middle roll fixed, 29" pinion and a manual screwdown. Quotation summarized as follows: (detailed specifications in folder)

- One ingot heating furnace
- Two capstans
- Two monorail hoist
- One furnace delivery table
- One mill approach table
- Two tilting mill front and back table
- One manipulator
- One mill runout table
- One shear approach table
- One up and down cut shear
- One shear gauge
- One saw approach table
- One hot saw
- One saw gauge
- One hot run table
- One transfer
- Five cradles

WEIGHT: 2,112,000#
SHIPMENT IN 9 MONTHS

PRICE F.O.B. in U.S.A.:
\$502,745.00

As an alternative to above quotation, United Engineering offered the following:

Same size but with bed plate 16', fixed bottom roll drive, end arranged for universal coupling, 31" pinion, and motor driven screwdown.

WEIGHT: 2,299,000#
SHIPMENT IN 9 MONTHS

PRICE F.O.B. IN U.S.A.:
\$565,775.00

EXHIBIT "B"

PROPOSAL FOR WIRE ROD MILL

SUBMITTED BY UNITED ENGINEERING & FOUNDRY CO. to

MITSUI & CO. (for KAWASAKI DOCKYARD) on Sept. 5, 1939 - United Inq.#9758

PROPOSAL FOR ROD MILL

ONE (1) ROD MILL - as shown on United's drawing PR-14618-H, revised 8-24-39, and consisting of the following units: (Drawing in folder)

One (1) Heating Furnace, to have a capacity of heating billets from 2-1/4" x 2-1/4" to 3" x 3", 15 ft. long, at the rate of 10 tons per hour. For this unit, UNITED will furnish full detail drawings in the English system. Furnace to be built in Japan.

One (1) Furnace Approach Table.

Table 18'-0" long, having 13 flanged rollers, 8" dia. x 6" long, spaced 18"; mounted overhung on cast and welded steel frame, chain driven through reducing drive. Customer to furnish billet storage rack or platform.

One (1) Furnace Charging Table.

Table 15'-0" long with 5 conical water cooled alloy steel rollers, spaced 3'-9", mounted skewed inside of charging end of furnace, lineshaft driven with drive and lineshafting outside of furnace.

One (1) Double Furnace Pusher

Four forged alloy steel pusher rams, motor operated through standard enclosed reducing drive, crank and levers.

One (1) Mill Approach Table.

Table similar to furnace approach table, 34'-6" long, with 24 overhung flanged rollers, 8" dia. x 6" long, chain driven.

One (1) 12" x 48" 3-High Roughing Mill, complete with -
Cast iron housings and bedplate; spring balanced top roll, hand operated screwdown and bottom roll screw-up.

One set of rolls, 13" dia. x 48" body length, necked and body rough turned, equipped with fabric bearings; Customer to furnish cooling water supply and discharge piping for bearings.

Cast steel splined end mill spindles and coupling boxes including spring balanced spindle carrier.

One 3-high pinion stand and one totally enclosed reducing gear drive, ratio 10:1, including flexible motor coupling and lead spindle.

Rest bars and guides included.

Motor operated circulating oiling system for gear drive and pinion stand.

One (1) 10" x 20" Intermediate Roughing Mill Train, complete with -
Three (3) double or duo roll stands with cast iron housings and caps;
each stand with totally enclosed combination gear drive and pinion
stand, cast steel mill spindles and coupling boxes with spring
balanced spindle carriers.

Bedplates under mill stands and spindle carriers only, pinion
stands to rest on foundations.

One totally enclosed reducing gear drive, ratio 6.25:1, including
flexible motor coupling and lead spindle and drive shaft to
pinion stands.

One set of 10-1/2" x 20" rolls, necked and bodies rough turned,
equipped with tapered roller bearings.

Twist guides between duo passes, entry and delivery guides, and
two single strand repeaters.

Motor operated circulating oiling system for gear drive and pinion
stands.

Roll neck bearings equipped with fittings for hand pressure grease
lubrication.

Customer to furnish chute from 12" rougher to intermediate rougher
and looping chutes on front and back side of mill.

One (1) 10" x 20" Finishing Train, complete with -

Four (4) double or duo roll stands with individual combination
gear drives and pinion stands, spindles, coupling boxes and
spindle carrier, similar to those of the intermediate roughing mill.
Pinion stands direct connected to motor by flexible lead spindle
and drive shaft.

One set of 11" x 21" rolls, necked and bodies rough turned, equipped
with tapered roller bearings.

Twist guides between duo passes, entry and delivery guides and
three double strand repeaters.

Motor operated circulating oiling system for pinion stands.

Roll neck bearings equipped with fittings for hand pressure
grease lubrication.

Customer to furnish looping chutes on front and back side of mill.

Two (2) Vertical Pin Reels, complete with kick-offs, similar to
those specified for the 20", 18" and 12" mill above.

Customer to furnish coil conveyor, all floor plates and floor
supporting structure.

ESTIMATED ROUGH WEIGHT: 620,000#

PRICE: \$208,000.00

Not included in the above prices are -

- Motors, control and all other electrical equipment;
- Foundation bolts and washers;
- Heating furnaces and equipment;
- Floor plates and supporting framework, walkways and cross-overs;
- Coil conveyors;
- Scales.

Prices quoted are f.a.s. New York City boxed for ocean shipment.

SHIPMENT: 8 months provided that we receive from you complete electrical information, including certified prints of all electrical equipment necessary for us to complete our engineering drawings within one month from date of receipt of your order.

EXHIBIT "C"

UNITED ENGINEERING AND FOUNDRY CO. QUOTATION #9758, Dec. 19, 1939
for ROLL EQUIPMENT, GUIDES AND REPEATERS FOR KAWASAKI DOCKYARD

QUOTATION FOR ROLL EQUIPMENT, GUIDES AND REPEATERS

"We have your letter of Dec. 5th 1939, asking for proposal covering complete roll equipment, also engineering design only, including detailed drawings for all guides and repeaters, for rolling from 3x3" billets to 0.197 rod in 19 passes. On separate sheet, we are quoting you on one complete filling of rolls for the mill, including one set for the 3H roughing 12" mill. You will note, in this quotation, we are giving you prices per pair for rolls necked and rough turned (plain) and also a price per pair for rolls finished complete.

"In line with practice on rod mills in this country, we would recommend that your clients purchase three complete sets of rolls for this installation. One set of these rolls could be furnished finished complete and the other two sets could be furnished necked and rough turned plain; the grooving of the additional two sets of rolls could be done by Kawasaki Dockyard Roll Shop, which would save them substantially \$148.00 per pair.

"Our reason for recommending three sets of rolls is that one set would be working in the mill; the second set being redressed and the third set for emergency spares. For furnishing all necessary tools and templets for turning the rolls, our price would be ... \$3,325.00. In the case of gang tools, this price includes tool holders and plug holders. For complete designing roll passes, our price would be ... \$880.00. Drawings for roll passes of rolls to be furnished the customer. For engineering work only, including detailed drawings for all necessary guides and repeaters, our price would be ... \$10,030.00.

"All of the above prices are f.o.b. points of shipment with inland freight prepaid to the ports of Baltimore, Philadelphia or New York, prepared for ocean shipment.

SHIPMENT: All necessary rolls, three sets, 14 to 16 weeks from receipt of order. All tools and templets would be shipped with the final shipment of rolls. All engineering work, including detailed drawings for necessary guides and repeaters, two months."

EXHIBIT "D"

RUST FURNACE CO. QUOTATION of January 19, 1940
for BILLET HEATING FURNACE FOR KAWASAKI DOCKYARD

QUOTATION FOR BILLET HEATING FURNACE

"We will furnish full engineering services and complete detail drawings in the English system for one continuous, recuperative, billet heating furnace for a price of \$7500.00.

"We understand that the furnace is to heat billets 2-1/4" square up to 3" square, 16'-0" in length. The furnace will be side charged and side discharged and will utilize coke-oven or mixed gas as fuel. When heating the above size billets, the capacity of the furnace will be ten gross tons per hour. The approximate dimensions of the furnace will be 28'-6" overall in length, 20'-0" effective heating length, with an overall width of 21'-3" and an inside width of 18'-0". "

EXHIBIT "E"

SUMMARY OF PROPOSAL #9758 BY UNITED ENGINEERING AND FOUNDRY CO.
September 5, 1939 for a BAR AND MERCHANT MILL for KAWASAKI DOCKYARD

SUMMARY OF PROPOSAL FOR A BAR AND MERCHANT MILL

Mill "for rolling billets from 3" x 3" up to 8" x 8" into merchant bars and rods, one 20" and 18" mill to produce 90,000 tons of 1 and 1/2 inch to 4" rounds, squares, hexagons and other equivalent sections, at the same time acting as a breakdown mill for a 12" mill to produce additional 60,000 tons of 1/2" to 1 and 1/2 inch rounds, squares, hexagons and equivalent sections, and for a third mill to produce additional 30,000 tons of small sections down to 5 mm. diameter rods."

United Engineering quoted a 20", 18", and 12" merchant mill for the Kawasaki Dockyard. The quotation is summarized as follows: (detailed specifications in the folder)

- One billet heating furnace
- One double furnace pusher
- One furnace ejector
- One furnace delivery table
- One 20" mill train complete
- One set of mill tables and transfers
- One 20" mill runout table
- One 18" 2-high mill stand
- One saw approach table
- One #75 sliding frame hot saw
- One saw runout table
- One cooling bed and table
- One #4 and 1/2 vertical shear
- One back shear table
- One kick off
- One set of cradles
- One 12" mill train
- One underground upcut lever shear
- One shear gauge
- One 12" mill approach table
- Floor rollers and chain transfer
- One cooling-bed run-in table
- One mechanical hot bed
- One cooling bed run-out table
- One #3 vertical shear and gauge
- One shear delivery table
- One kick off
- One set of cradles
- Two vertical pin reels
- One portable crop shear

WEIGHT: 5,033,100#
SHIPMENT IN 8 MONTHS

PRICE F.O.B. IN U.S.A.:
\$1,137,500.00