(17)

ARMY SERVICE FORCES MANUAL **M 354-12**

CIVIL AFFAIRS HANDBOOK

JAPAN

SECTION 12: COMMUNICATIONS

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HEADQUARTERS, ARMY SERVICE FORCES, 24 FEBRUARY 1944

ARMY SERVICE FORCES MANUAL

M 354-12
Civil Affairs

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NUMBERING SYSTEM OF

ARMY SERVICE FORCES MANUALS

The main subject matter of each Army Service Forces Manual is indicated by consecutive numbering within the following categories:

M1 - M99	Basic and Advanced Training
M100 - M199	Army Specialized Training Program and Pre-Induction Training
M200 - M299	Personnel and Morale
M300 - M399	Civil Affairs
M400 - M499	Supply and Transportation
M500 - M599	Fiscal
M600 - M699	Procurement and Production
M700 - M799	Administration
M800 - M899	Miscellaneous
M900 up	Equipment, Materiel, Housing and Construction

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HEADQUARTERS, ARMY SERVICE FORCES,
Washington 25, D. C., 24 FEBRUARY 1944

Army Service Forces Manual M 345-12, Communications in Japan, has been prepared under the supervision of The Provost Marshal General, and is published for the information and guidance of all concerned.

[SPX 461 (21 Sep 43).]

By command of Lieutenant General SOMERVELL:

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INTRODUCTION

Purposes of the Civil Affairs Handbook.

The basic purposes of civil affairs officers are (1) to assist the Commanding General by quickly establishing those orderly conditions which will contribute most effectively to the conduct of military operations, (2) to reduce to a minimum the human suffering and the material damage resulting from disorder, and (3) to create the conditions which will make it possible for civilian agencies to function effectively.

The preparation of Civil Affairs Handbooks is a part of the effort to carry out these responsibilities as effeciently and humanely as possible. The Handbooks do not deal with plans or policies (which will depend upon changing and unpredictable developments). It should be clearly understood that they do not imply any given official program of action. They are rather ready reference source books containing the basic factual information needed for planning and policy making.

Revision for Final Publication.

This study on Communications in Japan was compiled from various official and other authoritative sources for the Military Government Division of the Office of the Provost Marshal General. It is a preliminary draft, and will be revised preparatory to its incorporation in the Civil Affairs Handbook on Japan as a whole.

Officers using this material are requested to make suggestions and criticisms indicating the revisions or additions which would make this material more useful for their purposes. These criticisms should be sent to THE CHIEF OF THE LIAISON AND STUDIES BRANCH, MILITARY GOVERNMENT DIVISION, PMGO, 2807 MUNITIONS BUILDING, WASHINGTON 25, D.C.

C I V I L   A F F A I R S   H A N D B O O K S

T O P I C A L   O U T L I N E

1. Geographical and Social Background
2. Government and Administration
3. Legal Affairs
4. Government Finance
5. Money and Banking
6. Natural Resources
7. Agriculture
8. Industry and Commerce
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13. Public Health and Sanitation
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15. Education
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This study on Communications in Japan was compiled from various official and other authoritative sources for the MILITARY GOVERNMENT DIVISION of the OFFICE OF THE PROVOST MARSHAL GENERAL.

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JAPAN: COMMUNICATIONS

1. General -- a. Government control. Domestic communications, with the exception of radio telephony, are directly under the control of the Ministry of Communications. Radio telephony and all international communications are supervised by the International Telecommunications Company, a semi-official company controlled by the Ministry of Communications. Radio broadcasting, which is under the supervision of the Japan Broadcasting Corporation, is also under Government control. All communications facilities are considered part of the national defense system, and important details were classified as military secrets even before the outbreak of hostilities in 1937.

b. Facilities. -- Communications in Japan Proper are well developed and first-class equipment is used. Facilities, however, have not kept pace with public demand. The radio communications network is ample with many strategically placed stations. Telegraph equipment is modern, but facilities and personnel are inadequate to handle the present heavy volume of traffic. Telephone facilities are inadequate, although the equipment is good.

Japanese policy insures that the needs of the Army, Navy, and industries directly involved in the war effort are adequately served, often at the expense of individual and commercial interests.

The supply of communications equipment is considered to be independent of foreign sources. Foreign equipment and methods have been carefully studied over a long period of years and the best qualities incorporated in the Japanese products, often with improvements.

New construction is largely limited to the development of radio communication facilities in Japanese-controlled territories, the inauguration of new international radio channels, and the laying of telephone cables within Japan, Korea, Manchuria, and North China.

c. Personnel. There is a shortage of personnel due to the demands of the war. However, as in the case of facilities, the war effort is not allowed to suffer from this shortage. For some time blind soldiers have been regularly trained for communications work. For many years the Japanese have been sending young men abroad for intensive training, and Japan is now independent of foreign technicians.

d. Shortage. As Japan has been suffering from a serious shortage of some basic materials, especially copper, substitute materials are used wherever possible.

e. Conclusions. Japan's communications system is modern and has been completely organized and utilized for war purposes. Some inconvenience may be caused by enemy raids due to the difficulty of replacing or repairing equipment. However, the duplication of facilities makes a complete disruption of the communications system very difficult.

Table 1. General communications statistics of Japan Proper

Post, telegraph, and telephone employees (1938)	227,865
Post, telegraph, and telephone offices (September, 1939)	15,707
Telegraph routes (March 31, 1939)	30,611 miles
Telegraph lines (March 31, 1939)	232,534 miles
Telegrams dispatched (fiscal year ending March 31, 1939)	77,100,170
Telegrams received (fiscal year ending March 31, 1939)	83,023,060
Telephone subscribers (September 30, 1939)	1,006,498
Telephone routes (March 31, 1939)	49,939 miles
Telephone lines (March 31, 1938)	4,730,940 miles
Telephones (March 31, 1938)	1,019,319
Telephone messages (fiscal year ending March 31, 1939)	4,679,321,936
Total receipts from post, telegraph, etc. (fiscal year ending March 31, 1939)	$ 95,367,230
Total expenses of post, telegraph, etc. (fiscal year ending March 31, 1939)	$ 65,519,410

2. <u>Radio</u>. -- <u>a</u>. <u>Radio telegraph</u>. -- <u>General</u>. -- Japan has been especially interested in radio in the field of communications. The development of the radio network has been encouraged rather than the laying of new cables, as affording a more flexible and less vulnerable means of communications. Continual efforts are made to improve the equipment, which is modern and satisfactory.

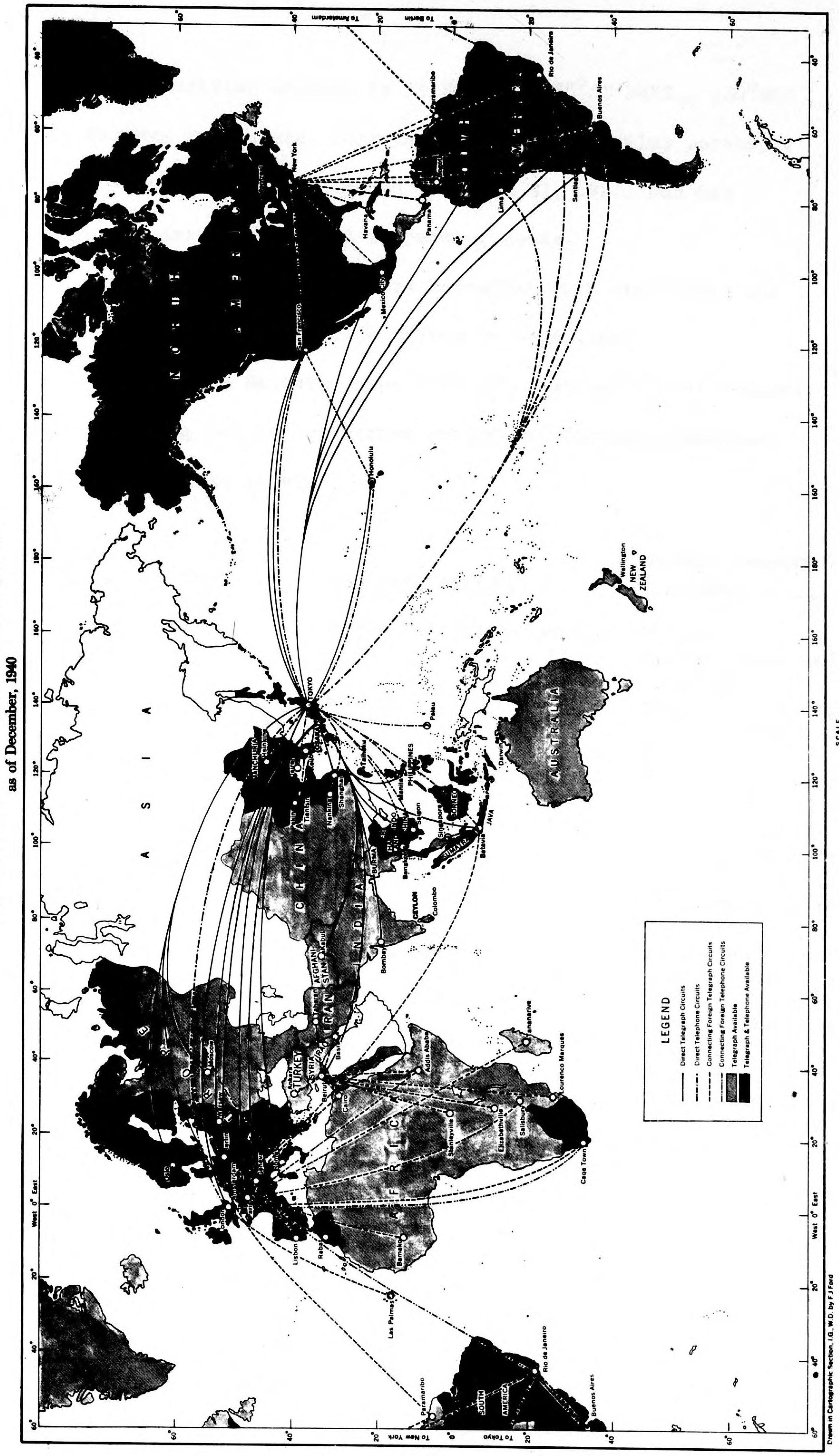
In common with most other countries, short-wave transmission is in favor in Japan. Long-wave transmission, however, is also available, especially for occasional use on transmissions to Europe, as long waves are less subject to disturbance by polar magnetic storms. The antenna power of the transmitters used varies from 1 to 40 kilowatts. Both automatic (tape) and manual systems are in use.

<u>Domestic radio telegraph</u>. The domestic radio telegraph system includes the radio channels between principal cities in the Empire and between home cities and colonies, certain outlying islands, Manchuria, Inner Mongolia, shipping at sea, and aircraft. This service is used very little where telegraph land lines are available.

<u>International radio telegraph</u>. -- Two systems, the Eastern Japan Radio Central at Tokyo, and the Middle Japan Radio Central at Osaka, are used for international radio telegraph communications.

<u>Eastern Japan Radio Central</u>. -- The transmitting station of the Eastern Japan Radio Central is at Oyama (36°16'32"N., 139°48'00"E.), Tochigi Prefecture, near Utsunomiya, about 45 miles north of Tokyo. This station was opened on December 31, 1927, and has recently been extended.

Japan's International Radio Communications Systems
as of December, 1940



The receiving station is at Fukuoka (35°52'34"N., 139°31'04"E.), Saitama Prefecture, near Kawagoe, about 20 miles northwest of Tokyo. This station was opened on March 31, 1927, and has recently been extended to meet increasing needs.

The above two stations are connected with each other and with the Tokyo Central Telegraph Office by land lines.

In 1940 the Eastern Japan Radio Central had direct channels with the following points; countries served and foreign companies or agencies are also given.

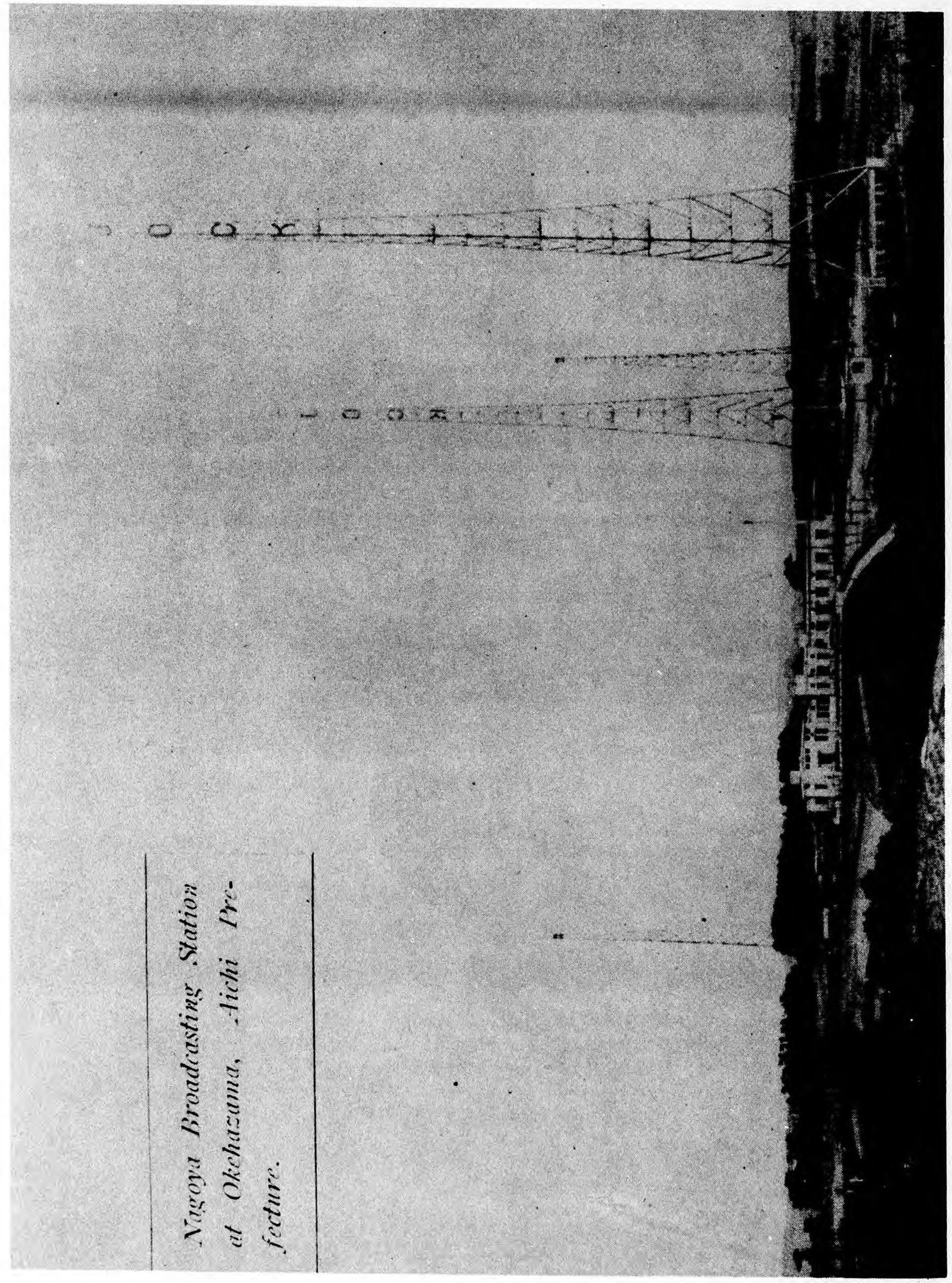
From Tokyo direct channels to	Countries served	Foreign company or agency
San Francisco	North and South America	R.C.A.
San Francisco	" " " "	Mackay Radio and Telegraph
Mexico City	Mexico	Mexican Telegraph Administration
Honolulu	Hawaii	R.C.A.
Buenos Aires	Argentina, South America	Transradio Internacionale
Rio de Janeiro	Brazil, South America	Compania Radiotelegrafica Brasilera
Santiago	Chile	Transradio Chiliana Compania Radiotelegrafica
Oslo	Norway, Sweden, Denmark	Norwegian Telegraph Administration
Moscow	European Russia	U.S.S.R. Telegraph Administration
Geneva	Switzerland	Compagnie Radio Suisse
Rome	Italy	Compagnia Italo Radio
Peiping	North China	North China Telegraph and Telephone Company
Lima	Peru	

Middle Japan Radio Central. -- Until 1938 the only controlling station of the Middle Japan Radio Central was located at Nagoya, with the transmitting station at Yosami (34°58'15"N., 137°01' 18"E.), near Kariya, about 20 miles southeast of Nagoya, and the receiving station at Yokkaichi (Kaizo) (34°59'27"N., 136°37'25"E.), about 20 miles southwest of Nagoya. These stations were connected with each other and with the Nagoya Central Telegraph Office by land lines.

Since 1938 most of the traffic of the Middle Japan Radio Central has been handled through the Osaka Central Telegraph Office, which is also connected with the Yosami and Yokkaichi stations by land lines. A large new receiving station was completed in 1938 at Ono, Hyogo Prefecture, about 20 miles northwest of Kobe, and construction on a transmitting station at Semayama, Kawachi Gun, a short distance southeast of Osaka, was begun in 1938. The latter station is now probably in operation. Details of these new stations are not available, and it is not known whether these stations supplant or supplement the Yosami and Yokkaichi stations in the Middle Japan Radio Central.

The Middle Japan Radio Central had direct channels to the following points in 1940:

From Osaka direct channels to	Countries served	Foreign company or agency
Shanghai	North China	North China Telegraph and Telephone Company
Tientsin	North China	North China Telegraph and Telephone Company
Bombay	British India, Burma, Ceylon	India Radio and Cable Company
London	England, Europe, and S. Africa	Cable and Wireless Company
Berlin	Germany, Europe	Deutsche Reichspost Ministerium



Nagoya Broadcasting Station at Okehazama, Aichi Prefecture.

Warsaw	Poland, Europe	Ministry of Post and Telegraph
Paris	France, Europe, Morocco, French African Colonies	Compagnie Radio France
Manila	Philippines	R.C.A.
Bandoeng	Netherlands Indies, Malaya	N.E.I. Telegraph Administration
Saigon	French Indo-China	French Indo-China Administration
Amsterdam	Holland, Europe, West Indies, Surinam	Administration of Posts, Telegraphs, and Telephones
Bangkok	Thailand	Administration of Posts, Telegraphs, and Telephones
Beirut	Near East, Arabia, Egypt	Radio Orient
Kabul	Afghanistan	

b. Radio Telephone. -- Domestic. Many cities and outlying islands of Japan proper are dependent on radio for communications, due to the inadequacy of Japan's long distance telephone network. The Japanese mention specifically the following radio telephone channels within Japan proper:

A multi-circuit ultra-short wave system across the Tsugaru Straits between Ishisaki, Aomori Prefecture, and Hakodate, Hokkaido, with a frequency of about 75,000 kilocycles. Six conversations can be carried on simultaneously.

A similar system between Hokkaido and Karafuto, probably between Wakkanai and Otomari. The above two systems supplement the existing submarine telephone cables.

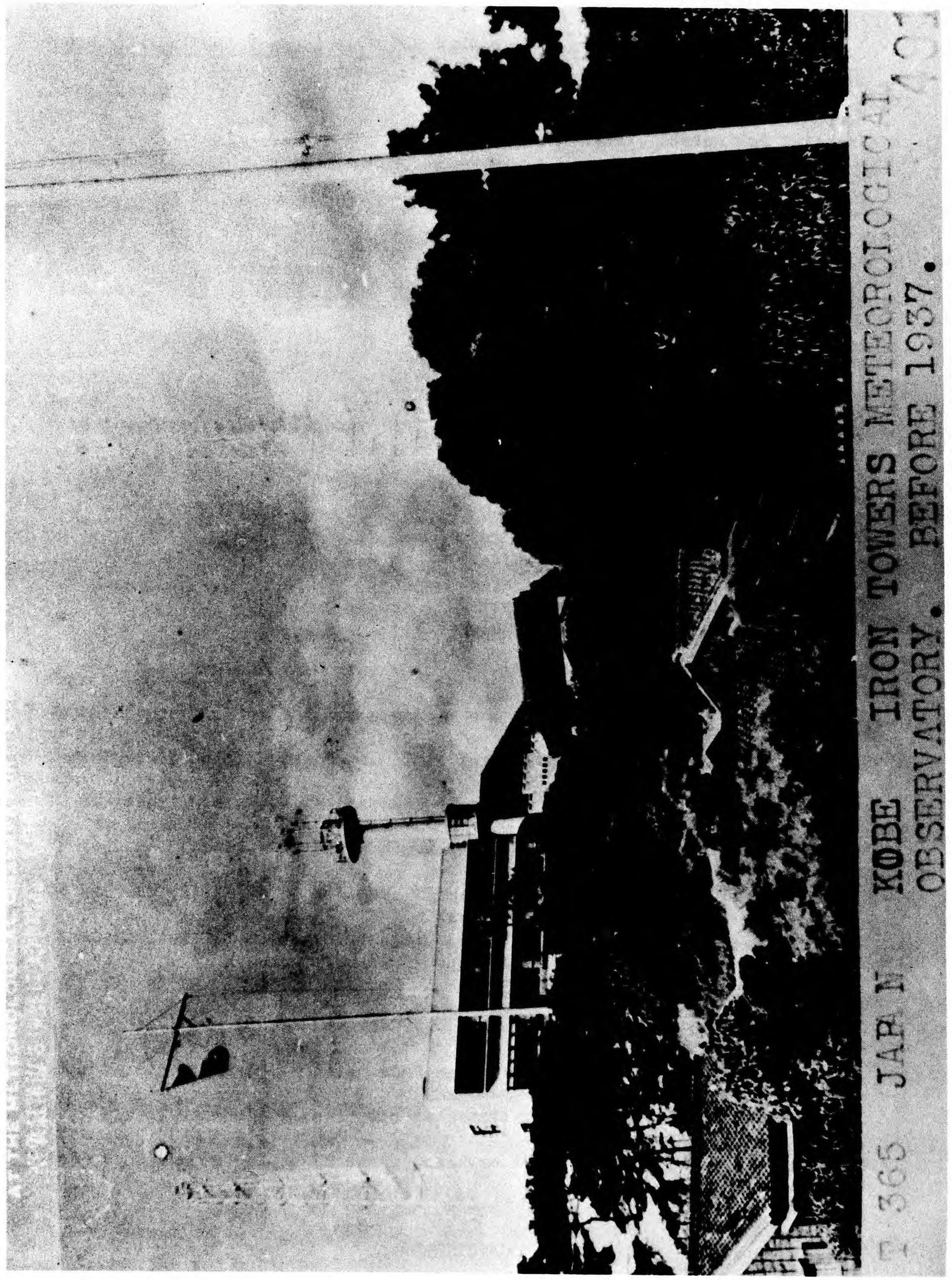
A system using frequencies of 34,000 and 39,000 kilocycles between Sakata and Tobi Shima in Yamagata Prefecture, horthwest Honshu.

Between Kagoshima, southern Kyushu, and Naze, Amani O Shima, in the Nansei Shoto.

Empire and international. -- The principal transmitting station for Japan's Empire and international radio telephone system is at Nasaki, Ibaraki Prefecture (36°10'44"N., 139°51'E.), and the principal receiving station is at Komuro, Saitama Prefecture (35°58'N., 139° 38'E.). The Nasaki station has short-wave transmitters of 10,20 and 50-kilowatt antenna powers. The 10 and 20-kilowatt transmitters are most frequently used. These transmitters operate on many different frequencies and call letters. The receiving station at Komuro is equipped with short-wave receivers using the superheterodyne circuit. The Nasaki and Komuro stations are connected with each other and with the Tokyo Central Telephone Office by cable.

At the end of 1940 the following channels were in operation:

Tokyo (Nasaki and Komuro) to:	Remarks, date of opening of circuit:
Taihoku, Formosa	June 20, 1934
Hsinking, Manchuria	1934-1935
San Francisco, U.S.A.	1934-1935 Through San Francisco, telephone connections to all parts of U.S., Mexico, most of Canada, and Cuba.
Manila, Philippines	1934-1935
Bandoeng, N.E.I.	1934-1935 Through Bandoeng connections to Sumatra, Borneo and Celebes.
London, England	1934-1935 Through London connections to Cape Town, South Africa, 1936.
Berlin, Germany	1934-1935 Through Berlin to Sofia, October 25, 1939. Through Berlin to Lisbon, reopened April 20, 1942. Only conversations in Japanese allowed.
Dairen, Kwantung Leased Territory	March 5, 1937
Shanghai, China	February, 1936
Nanking, China	October 8, 1939
Rio de Janeiro, Brazil	June, 1940
Saigon, French Indo-China	May, 1936
Buenos Aires, Argentine	1937 Through Buenos Aires connection to Uruguay and Paraguay.
Bangkok, Thailand	March 11, 1937
Honolulu, Hawaii	1937
Santiago, Chile	June, 1938



Tokyo (Nasaki and Komuro) to:	Remarks, date of opening of circuit:
Rome, Italy	October 7, 1938 Through Rome connections to Belgium, Hungary, Holland, Sweden and Switzerland.
Lima, Peru	1939 Service operated jointly by the All American Cables and Radio, Inc., and the Compania Peruanna de Telefonas Linitada.
Palau, South Seas Mandated Islands	March 21, 1940 Both sending and receiving stations of 10 and 20-kilowatt power, were established on the island. 1940. Only conversations in Japanese allowed.
Kabul	Kabul - Berlin radio telephone available.
Ship-to-shore radio telephony	Regular ship-to-shore telephone service on several liners formerly used on the Japan-Europe, Japan-South Seas, and Japan-South America routes. These ships were also used as relay stations, supplementing the regular station to station circuits. Ship-to-shore radio on 6 ships on the Japan-Dairen and Japan-Formosa routes are maintained.

A supplemental transmitting station for radio telegraph and telephone communications was recently completed at Semayama, Minami-Kawachi-Gun, Osaka Prefecture. This large-station is equipped with 10 80-meter antennae. The receiving station is located at Ono, Hyogo Prefecture. These stations are connected with each other and with the Osaka Central Office by cables. These stations are used for direct channels from Osaka to southeastern Asia.

c. Radio braodcasting. -- Standard wave. -- All broadcasting in Japan proper is done by the Japan Broadcasting Corporation (Nippon Hoso Kyokai), a Government agency directly controlled by the Ministry of Communications. The corporation is supported by an operating fee of 50 sen (about 12 US cents) paid monthly by every owner of a radio set.

The total income of the corporation for the fiscal year ending March 31, 1939, was ¥ 22,286,061 (about US $ 5,348,654).

The Japanese Government, the Army, and the Japanese Broadcasting Corporation are all agreed on a policy of expansion of broadcasting. For national purposes liaison is established between the broadcasting network and the local military districts.

There are 44 broadcasting stations in Japan proper. Key stations are located at Tokyo, Osaka, Nagoya, Kumamoto, Hiroshima, Sendai, and Sapporo. The Tokyo station has a power of 150 kilowatts, the other six 10 kilowatts each. The power of the Osaka and Kumamoto stations may have been increased to 100 kilowatts. The remaining 37 stations are relay stations, ranging in power from 0.3 to 3 kilowatts. All stations are linked by a permanent relay line, so that chain broadcasting is possible, as well as techniques, such as synchronised broadcasting and alternating broadcasting, to render broadcasting stations useless for radio location by enemy aricraft. In synchronised broadcasting the same programs are broadcast simultaneously from several stations, all using the same frequency. In alternating broadcasting, programs are shifted from one station to another with an instantaneous interchange of frequencies.

The broadcasting stations are evenly distributed on a plan aiming toward an ideal of one-station reception in all regions. This distribution serves the dual purpose of making Japanese radio programs available to everyone, and of discouraging facilities which would make Japan a field for the dissemination of foreign propaganda. Low-powered

sets are capable of satisfactory service, and there is little encouragement to the purchase of higher- powered types which would be within the range of foreign long-wave broadcasting. Possession of short-wave radio receiving sets is forbidden to private individuals, and it is a punishable offense to listen to foreign broadcasts using a set licensed for receiving long-wave broadcasts from Japanese stations.

Despite the low standard of living, there are more than 5,000,000 radio sets in Japan proper, or over 35 sets per 100 families. The Government is making efforts to place a receiver in every home, and low-powered sets are available at extremely low prices (US $ 2.00). In spite of present difficulties, it is not believed that the manufacture of such sets will be discontinued.

Table 2. Number of radio licenses by localities in Japan proper (May 1940)

Locality	No. of licenses	Per 100 families	Locality	No. of licenses	Per 100 families
1. Aichi	270,978	44.9	19. Kochi	29.764	19.1
2. Akita	26,522	14.7	20. Kyoto	175,476	47.1
3. Aomori	26,151	15.3	21. Kumamoto	80,885	30.5
4. Chiba	91,087	30.1	22. Niyagi	57,298	27.3
5. Ehime	47,838	19.4	23. Niyasaki	28,862	17.4
6. Fukui	31,034	22.6	24. Miye	52,836	21.8
7. Fukuoka	203,627	36.2	25. Nagano	86,908	26.1
8. Fukushima	44,972	16.0	26. Nagasaki	52,447	20.1
9. Gifu	63,760	25.5	27. Nara	45,244	35.8
10. Gumma	69,193	30.0	28. Niigata	102,397	28.2
11. Hiroshima	116,574	29.4	29. Oita	38,515	19.3
12. Hyogo	279,862	43.3	30. Okayama	76,472	26.5
13. Ibaraki	59,975	27.3	31. Osaka	552,797	55.4
14. Ishikawa	38,453	24.1	32. Saga	28,916	22.8
15. Iwate	26,843	15.0	33. Saitama	96,751	33.9
16. Kagawa	37,290	24.2	34. Shiga	34,965	22.8
17. Kagoshima	45,639	13.5	35. Shimane	34,795	22.0
18. Kanagawa	227,788	58.8	36. Shizuoka	137,724	37.8

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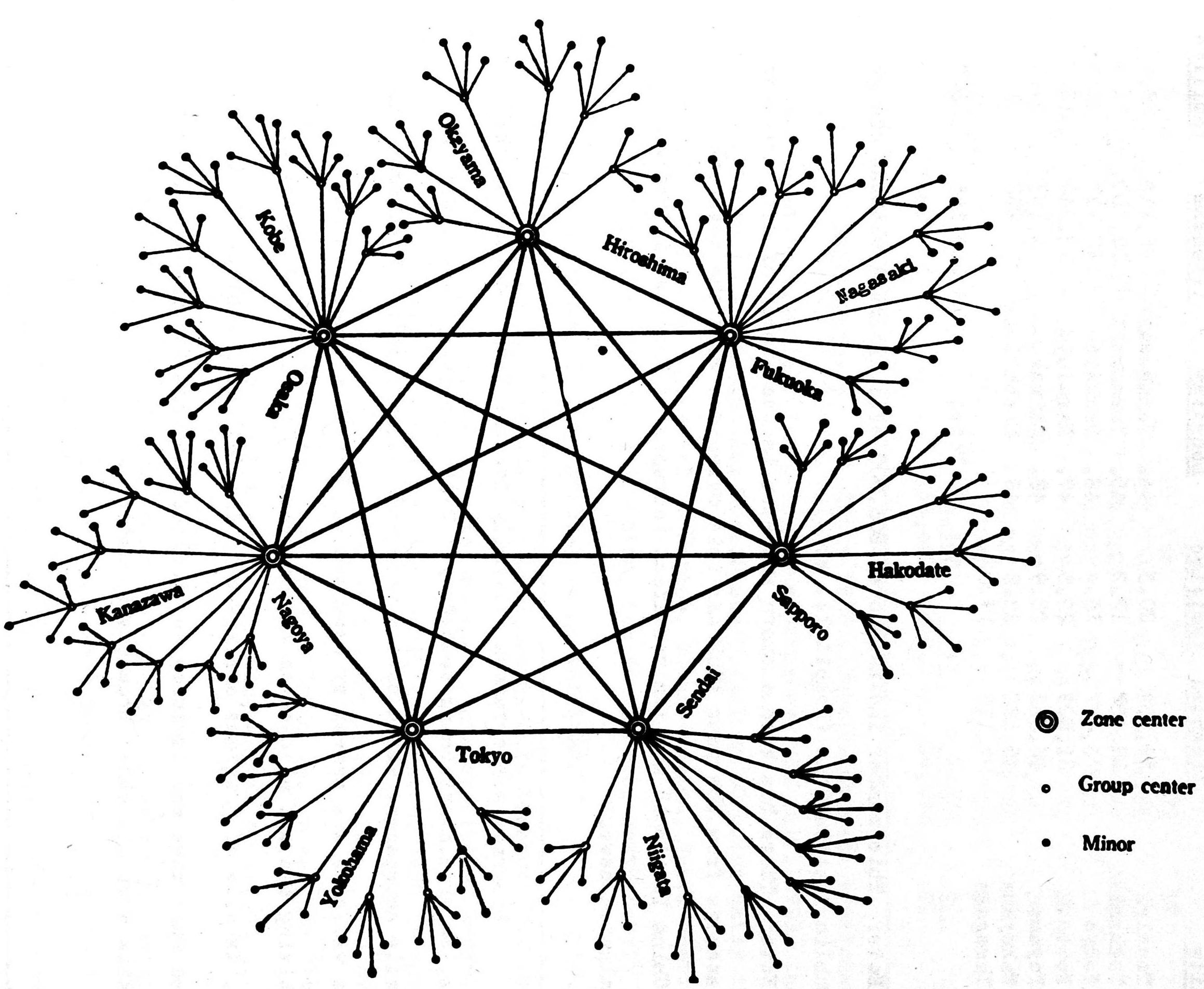

The Plan of Telegraph Zone System

Locality	No. of licenses	Per 100 families	Locality	No. of licenses	Per 100 families
37. Tochigi	59,732	20.3	44. Yamaguchi	75,114	28.2
38. Tokushima	28,457	19.2	45. Yamanashi	39,730	31.4
39. Tokyo	1,073,497	76.4	46. Hokkaido	147,917	25.3
40. Tottori	21,509	22.5	47. Karafuto	12,240	18.7
41. Toyama	45,563	28.9	48. Okinawa	1,127	00.9
42. Wakayama	45,162	23.9	49. South Seas	253	1.1
43. Yamagata	32,116	17.0			
			Total	5,003,055	35.3

Note: This number includes over 206,000 sets licensed without charge for public institutions (hospitals, etc.).

Note: There has been a sharp increase in the number of net increases of listeners from the year 1937 on; this coincides with the outbreak of the "China Incident" and the resultant increase of interest in radio-disseminated news.

Programs are arranged primarily for the "Instruction" of the people, entertainment being secondary. Radio programs are printed in the daily newspapers which have a very wide distribution. Even the most remote villages are served by newspapers. Political speeches and advertising are not allowed on the programs. Considering Japan as a whole, details of programs are given in the following table. It will be noticed that news and lectures, both direct mediums for propaganda, occupy more time than all other broadcasts combined.

Table 3. Nature of Broadcast Programs (fiscal year ending 31 Mar. 40)

Nature of broadcasts	Number of broadcasts	Percent of totals	Hours	Minutes	Percent of total
News	107,139	77.4	7,272	17	44.7
Lectures	8,295	6.0	2,959	15	18.2
Children's hour	2,529	1.8	649	15	3.9
School broadcasts	2,682	1.9	871	57	5.4
International broadcasts	85	.06	15	10	.1
Broadcasts of actual scenes	769	.54	1,141	30	7.0
Music	3,961	2.9	1,260	50	7.7
Drama	1,549	1.1	726	26	4.5
Miscellaneous	11,446	8.3	1,376	41	8.5
Total	138,455	100.0	16,273	21	100.0

Short-wave. — Since 1935 a regular oversea broadcast has been maintained, mainly for propaganda purposes. In July, 1939, the schedule included 12 separate broadcasts totalling 40 hours daily in 16 different languages, directed to Europe, South America, North America, Hawii, Australia, New Zealand, China, the South Seas, Southeastern Asia, Afghanistan, India, Turkey, Arabia, Iraq, and Iran.

At present Japanese short-wave propaganda broadcasting covers an equally wide area. In addition to the short-wave station at Tokyo, use is made of short-wave broadcasting stations in the Empire, much as the station at Taihoku in Formosa, and at Palau in the Mandated Islands, and of short-wave stations in occupied regions, such as Radio Saigon and the German-controlled station XGRS in Shanghai, for broadcasting or relaying Japanese-inspired programs.

Due to the fact that the residents of all Japanese-controlled areas are not allowed to possess short-wave radio sets, programs intended for these areas are relayed or rebroadcast by long-wave stations within range of the areas. The powerful Tokyo station JOAK No. 2 is also used for long-wave broadcasts to China and to Japanese troops in the field. A

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東京中央電信局（下）と共通信室（上）

Message Center, Tokyo Central Telegraph Office

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joint committee on the coordination of broadcasting between Japan, Formosa, Korea, Manchuria, Mongolia, and North China met in Taihoku, Formosa in November , 1940.

d. Radio telephoto. In 1941 radio telephoto was in use between Tokyo and London, Berlin, San Francisco, Shanghai, Buenos Aires, and Taihoku, and between Osaka and Hsinking. It is thought that secret documents are transmitted between Berlin and Tokyo by this method. Equipment used is now of Japanese manufacture and gives satisfactory results. Portable telephoto equipment has been developed and is used in Korea, Manchuria, and North China, especially for transmitting battle scenes.

e. Television. Television experiments have been carried out over a period of years, and public demonstrations have been given. No serious use, however, has been made of television for entertainment or communication.

f. Amateur radio. Even before the present hostilities there were only about 1,200 amateur radio operators, all of whom were licensed for carrying on special experimental work for the Ministry of Communications.

3. Wire communications. -- a. Telegraph. -- Japan proper is divided into seven telegraph zones (figure 4), with administrative bureaus located at the zone centers - Tokyo, Nagoya, Osaka, Hiroshima, Kumamoto, Sendai, and Sapporo. All telegrams are routed through zone centers to their final destinations. A strict censorship of all teltgrams is maintained at the zone centers.

The telegraph net is extensive, with facilities available at almost all the settlements. The lines in general follow the railroads and main highways. Almost two-thirds of the telegraph lines are aerial lines, strung on poles.

Table 4. Length of inland telegraph lines in miles (March 31, 1939)

	Routes	Lines and conductors
Land lines		
Aerial lines	30,439	140,594
Overhead cables	88	17,667
Underground lines	490	61,926
Submarine cables	9,594	12,347
Grand Total	40,611	232,534

Telegraph traffic is handled largely at post offices, although in some of the larger cities separate telegraph offices are maintained. In addition practically all railway stations are equipped with telegraph offices, about 2,250 of which are open to the public.

Table 5. Telegraph offices in Japan proper (September 30, 1939)

First class	8
Second class	47
Postal and telegraph offices	10,745
Minor offices	2,425
Total	13,225

Note: This total does not include radio telegraph stations.

Although Japan's ratio of telegraph offices to unit areas is only from one-fifth to one-third that of England, France, or Germany, the number of telegrams sent in 1939 exceeded the figure given for any European country, being second only to the United States. The total number of telegrams dispatched through inland post and telegraph offices increased from 60,436 in 1936 to 77,100,170 in 1939.

The automatic apparatus has been adopted for telegraph communications in most cities. There were about 70 circuits operated by this system in 1939. A sender is widely used having a capacity of about 80 letters per minute, when a typewriter is used. The Japanese claim to have perfected a highspeed instrument capable of transmitting and receiving 6,000 letters per minute in "kana" and 7,500 letters per minute in foreign languages.

Printer telegraph is in wide use in Japan. The types of apparatus in use are the Teletype, Baudot Multiplex. Western Electric Duplex, Morkrum Double Duplex, and the Japanese Letter Printer. The Japanese Letter Printer is of 6-unit code instead of the 5-unit code of the other types, because of the 48 "kana" in the Japanese syllabary as opposed to 26 letters in the English alphabet. The Japanese Letter Printer is a combination of a transmitter having a letter key-board, and a receiver with page printers, and can be employed either for simplex or duplex working. Modifications to allow for vertical and right-to-left printing may be present in the Japanese Letter Printer.

Table 6. Telegraphic apparatus (March 31, 1938)

Telephones for telegraphic service	8,622
Ink writers	2
Senders	5,918
Automatic telegraphs, duplex	178
Undulator and siphon recorders	17
Printing telegraphs duplex	84
Phototelegraphs	5
Telegraph repeaters	183
Portable telegraphs	24
Automatic telegraph repeaters	2
Simple exchange machines	2
Total	15,037

Note: The total number of telegraph apparatus had increased to 15,893 by March 31, 1939.

Central Switch Board, Japanese Army Shanghai

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The more than 20 percent increase in the total number of messages from 1936 to 1939 has seriously affected the efficiency of the telegraph service. The difficulties inherent in the Japanese language have also impaired the speed of transmission. The war shortage of personnel is especially felt in the telegraph system. The public has been urged to use letters rather than telegrams for all non-urgent matters. An increasing amount of time is being lost by the occurrence of faults in the telegraph system, pointing to inadequate maintenance of the equipment and facilities.

Table 17. Frequencies and hours of faults of telegraph land lines (fiscal year ending March 31, 1938)

	Frequencies	Hours
Crosses	3,990	18,392
Grounds	3,859	20,184
Opens	3,273	11,385
Leakage	382	4,040
Others	1,480	2,191
Total	12,984	56,192

b. Telephone. — General. On January 1, 1940, Japan was rated sixth in the world in number of telephones, fifth in telephone wire mileage, and second in number of telephone conversations. The large number of conversations is explained by the fact that telephones are concentrated in urban centers, where the existing facilities are inadequate for the great demand.

Table 8. Number of telephone subscribers by districts (March 31, 1939)

District	Number
Tokyo City	227,245
Tokyo District	105,263
Nagoya	134,053
Osaka	283,499
Hiroshima	82,365
Kummanoto	87,862
Sendai	49,367
Sapporo	36,844
Total	1,006,498

Note: This total represents an average of 1.38 telephones for every 100 persons in Japan proper.

Table 9. Telephones in large cities (March 31, 1939)

City	Estimated population	Number of telephones	Telephones per 100 population
Tokyo	6,458,000	290,510*	4.50
Osaka	3,321,000	176,697	5.32
Nagoya	1,224,000	46,122	3.77
Kyoto	1,160,000	51,457	4.44
Kobe	989,000	46,265	4.68

*Note: This number is larger than the number of subscribers in Tokyo City, and indicates that official and public telephones are included in these figures.

Table 10. Number of telephone messages (fiscal year ending March 31, 1938)

In the same subscription districts	
Messages between subscribers	4,679,321,936
Hours of conversations at offices and public telephones	59,852,742
Requests for calling out*	70,164
With other districts	
Hours of conversation	342,590,232
Requests for calling out*	2,621,762

*Also designated as "Requests of call".

Note: The number of conversations between subscribers increased to 4,905,533,000 during the fiscal year indeng March 31, 1939.

Of all the communication services managed by the Japanese Government the telephone is probably the least efficient. Expansion of local facilities has been slow and the number of new telephones installed has been only a fraction of the applications, owing to the insufficient number of exchanges. Telephones have been bought and sold by brokers, with widespread speculation and corruption. In December, 1940, however, the Ministry of Communications took over the distribution of telephones. New telephones are assigned only to individuals or concerns directly involved in the war effort.

Table 11. Number of telephone subscribers by type (fiscal year ending March 31, 1939)

Individual subscription	985,181
Party line subscription	19,595
Extension line subscription	11,722
Total	1,006,498
Applicants for telephones	123,963*

*Note: Of this number 25,000 were granted subscriptions during the fiscal year ending March 31, 1940. Significantly, 7,000 were allotted to Osaka alone.

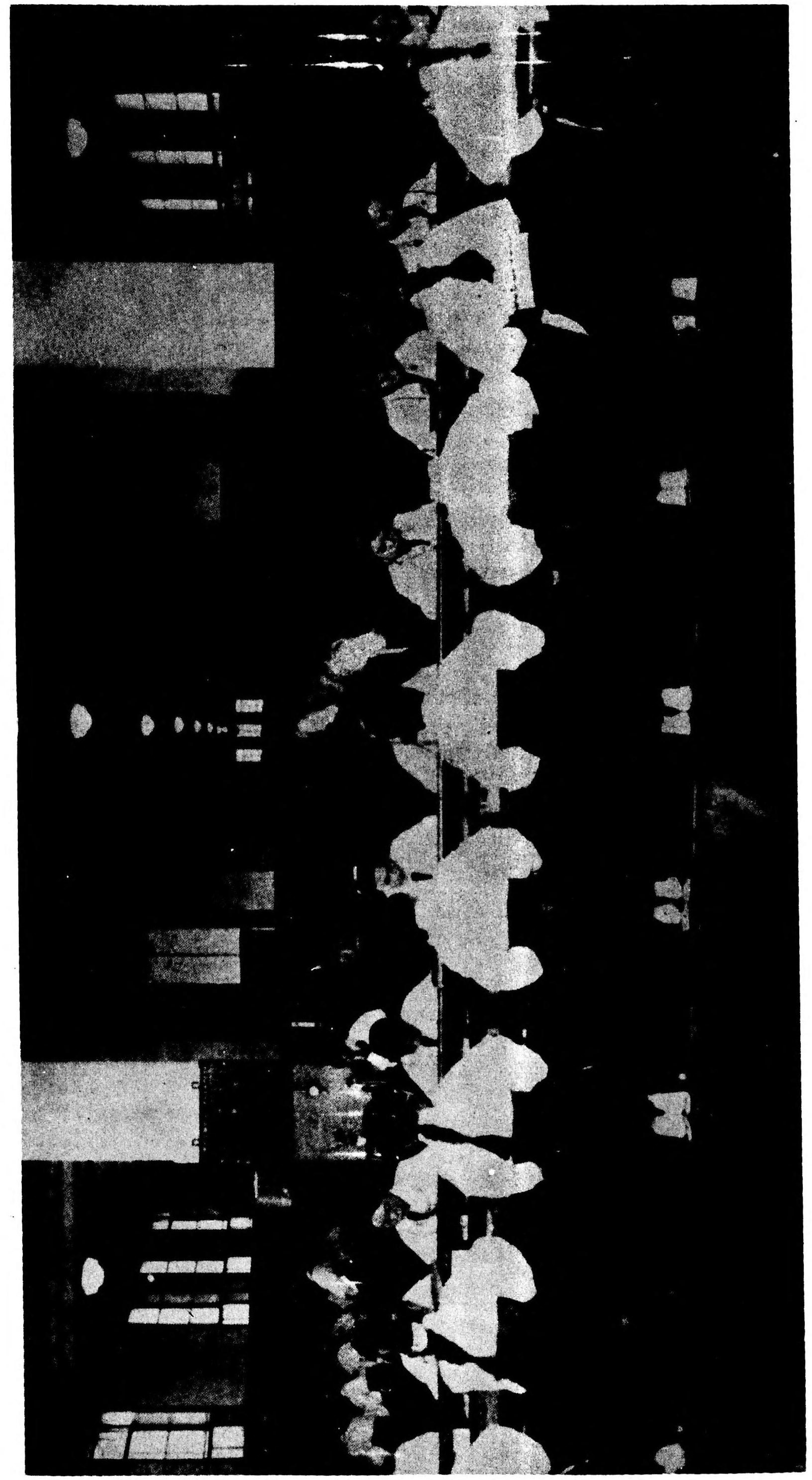
On the other hand, the expansion of Japan's long-distance telephone system has been encouraged. In 1936 an ambitious 5-year plan involving an investment of about US $92,000,000 was begun. As part of this program a non-loaded telephone cable between Tokyo and Mukden, Manchuria, with extensions to Hsinking and Peiping, was completed in 1940. This important cable has much improved telephone facilities between Japan, Korea, Manchuria, and Occupied China. Other plans under this 5-year program include the extension of the Tokyo-Mukden non-loaded cable to Dairen, Harbin, Chefoo, Nanking, and other points in Manchurai and Occupied China; the laying of non-loaded cable networks throughout the main islands of Japan, in general along the main railroads; and the laying of a telephone cable between Osaka and Shanghai via Shikoku and Kyushu (Nagasaki). The Nagasaki-Shanghai submarine section of the latter cable was planned to be loaded, the rest non-loaded. Certain sections of the proposed expansion have been completed but no information is available as to the progress of this program.

Facilities and equipment. -- In the larger cities there are offices used exclusively for telephone exchanges. Such large cities are divided into districts and each district has its telephone exchange. In the smaller cities and towns exchange work is conducted mainly by the post offices. It may be assumed that telephones are installed in all the 1,206 police stations, 4,757 police boxes, and 14,182 police sub-stations in Japan proper.

Table 12. Number of telephone offices (September 30, 1939)

Telephone offices	
First class	
Main	12
Branch	63
Second class	5
Total	80
Other offices	
Radio telephone	9
Offices in mimes	335
Telegraph and telephone message offices	54

RESTRICTED



Tokyo Central Telephone Office

RESTRICTED

Telephone offices in post offices	10,739
Total telephone offices	11,217
Telephone exchange offices	6,197
Public telephone stations	4,842
Grand total	22,256

Automatic telephones have been installed in many of the larger cities but manual switchboards are still prevalent. Automatic coin telephones have also been installed in a few cities. The automatic telephones originally used are of American and German manufacture, but since 1939 Japanese-made equipment has been available. There are three kinds of manual switchboards in use in local exchange offices: 1. Non-multiple magneto switchboard. This type is mostly used in small communities where subscribers do not exceed 500. 2. Series multiple magneto swotchboard, used where subscribers are less than 2,000 in number. 3. Common battery switchboards, the standard type in the larger cities prior to the adoption of the automatic system. There are still many of those 24-volt units in use.

Table 13. Quantities of telephone apparatus (March 31, 1938)

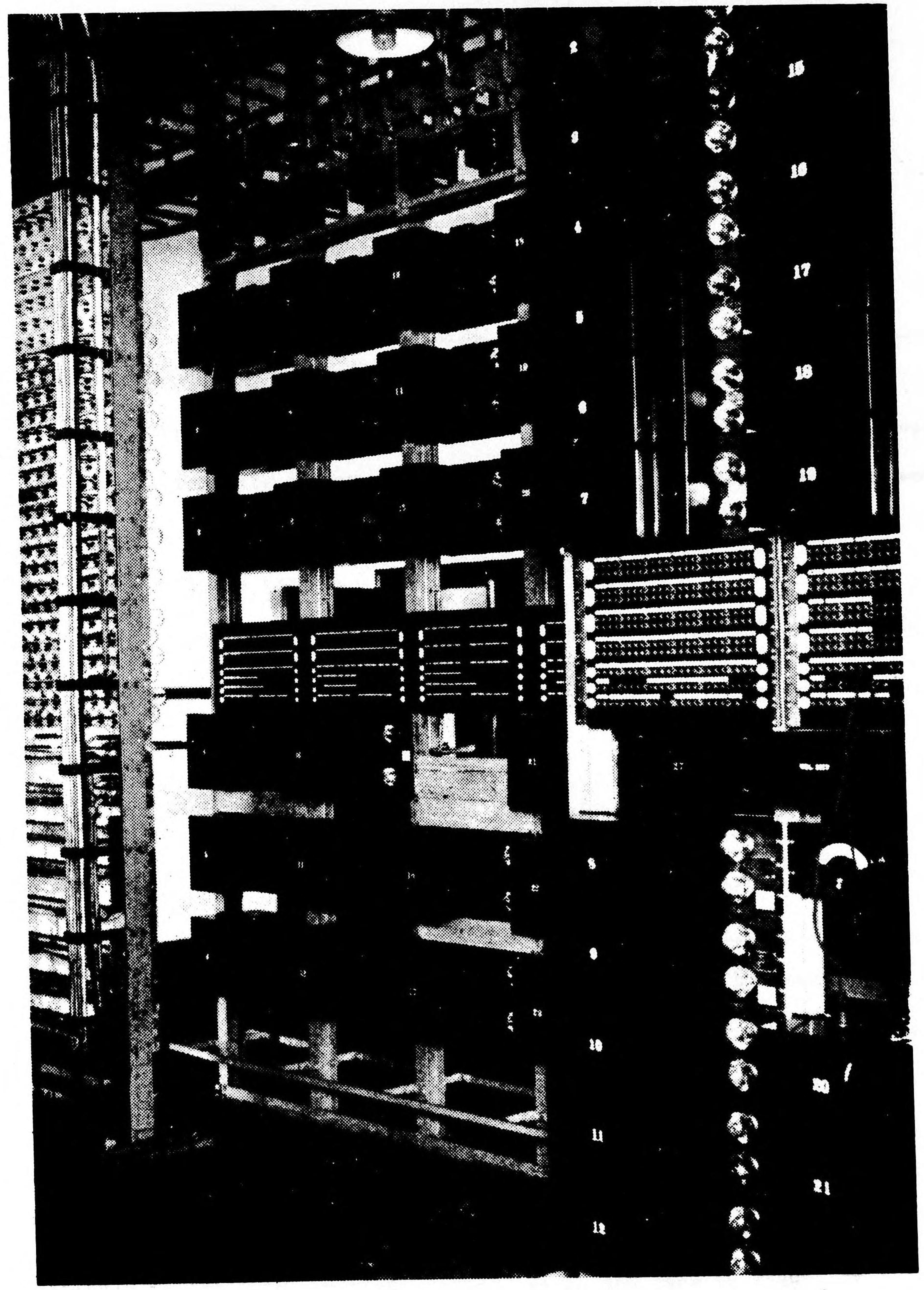
Magneto and common battery manual telephone exchanges	12,459
Automatic telephone exchanges	576
Line switches	329,461
Line finders	5,930
Connectors	49,180
Selectors	132,206
Telephones	1,014,336
Public telephones	4,983
Total	1,549,131

Table 14. Type and Number of Telephone Instruments (Mar. 31/37)

Wall sets	
Common battery system	376,017
Magneto system	268,630
Automatic system	196,759
Desk sets	
Common battery system	33,613
Magneto system	49,940
Automatic system	48,909
Public telephones	5,448
Total	979,316

Table 15. Type and number of telephone switchboards (March 31, 1937)

Manual telephone exchange	
"A" board	
Common battery multiple system	930
Magneto series multiple system	338
Magneto non-multiple system	6,301
"B" board	
Cord system	379
Cordless system	39
Toll board	
Common battery system	1,564
Magneto multiple system (large type)	403
Magneto single system (small type)	2,173
Total	12,127
Automatic telephone switchboard (Strowger system)	
Siemens and Halska system	
Line switchboard	665
Line switchboard equipped with 200 line switches	445
Selector board	428
Repeater board	68
Outgoing secondary line switchboard	143
Connector board	214
Line-finder frame	194
Connector frame	181
Selector frame	8



Repeater, Odawara Station, Tokyo-Kobe loaded telephone cable

Siemens Brothers system	
Primary selector board	817
Secondary selector board	183
Connector board	674
Selector board	1,279
Repeater board	163
Relay satellite exchange equipment	7
Rural automatic telephone exchange	7
Total	5,476

Main routes of subscribers' lines are underground but branch and service lines are generally aerial. Much of the long-distance telephone system still consists of bare aerial lines, although efforts are being made to replace these lines with cables. Toll telephone cables are overhead where circumstances permit.

Table 16. Length of inland telephone lines in miles (March 31,1939)

Land lines		
Aerial lines	39,022	390,599
Overhead cables	6,884	1,332,828
Underground cables	3,127	2,997,617
Submarine cables	906	9,896
Total	49,939	4,730,940

All special circuits and direct wires operated by banks and commercial firms between their offices in Tokyo and Osaka, etc., have been surrendered to the Government. Some circuits, however, may be retained by the newspapers and news services. There is also a large number of special circuits used by the police and by the railway bureau. It is thought that the police circuits are separate from the ordinary circuits, with police exchanges in the more important cities, as is the case in Tokyo.

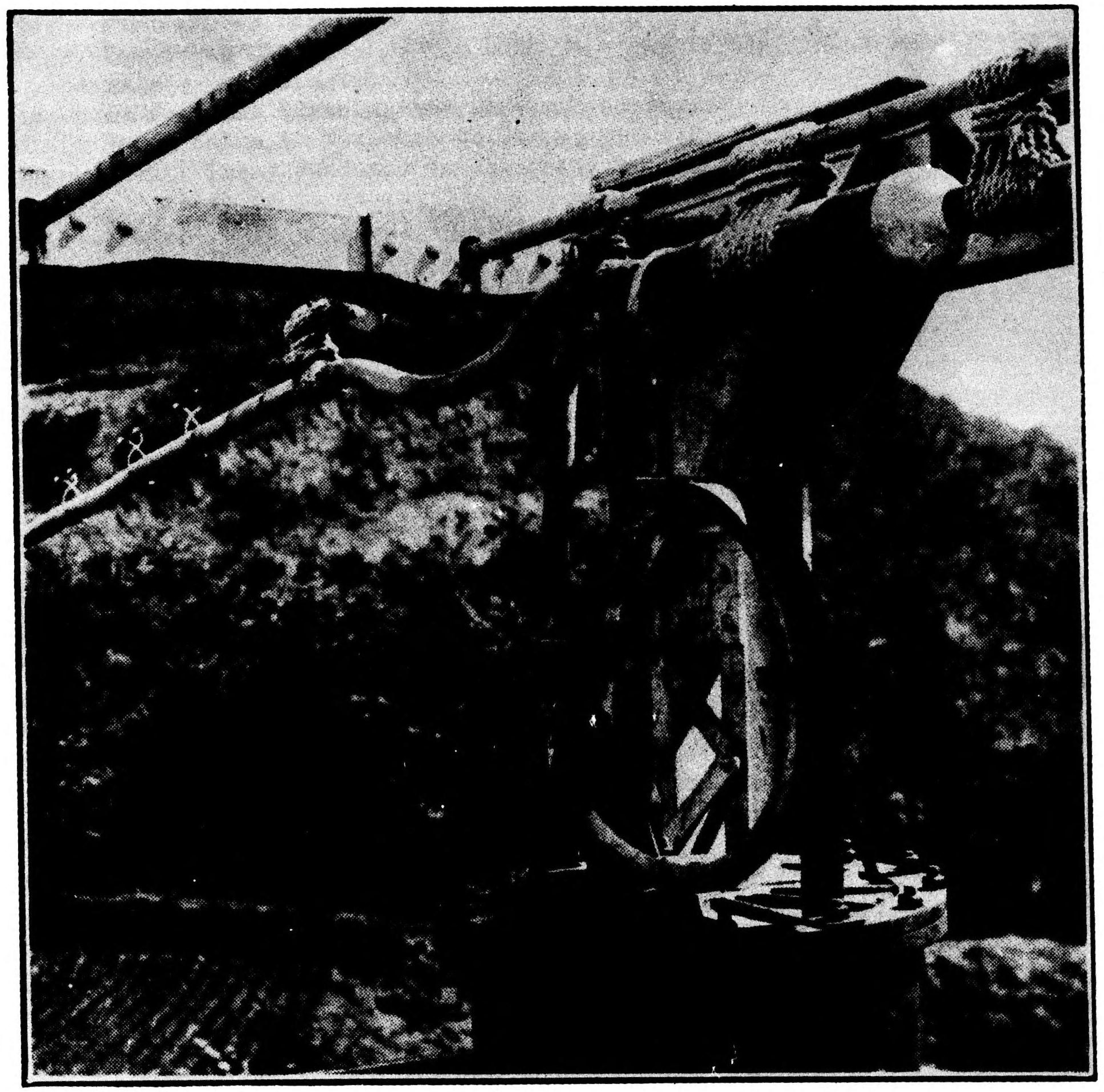
In order to avoid using the radio for air raid alarms, equipment has been installed to enable the existing telephone and telegraph lines to transmit alarms. Special receivers are installed in large department stores and Government offices.

Faults occur, on an average, almost twice a year for each telephone, a very high rate. This rate seems to be increasing faster than the rate of increase of telephones.

Table 17. Frequencies of faults with urban telephones

Faults	Fiscal year ending March 31, 1937	1938
Exchange offices	518,215	724,350
Subscribers	654,324	636,964
On routes	368,937	363,884
Total	1,541,476	1,725,198

c. Cables. -- Control. All cables in Japanese territory are owned by the Japanese Government and operated through the Ministry of Communications. At the present time practically all of the cables in the Far East are under Japanese control. The laying of additional cables is supervised by the International Telecommunications Company which cooperates with the Manchurian Telegraph and Telephone Company, the North China Telegraph and Telephone Company, and the Central China Electric Corporation. All the above companies are directly or indirectly controlled by the Japanese Government.



—Cable Joint, Coil and Stub, on Loading Coil Platform.

<u>Cable network</u>. Important submarine cables landing on Japan proper are given below:

Nagasaki to Vladivostok*	2
Nagasaki to Shanghai*	3
Nagasaki to Dairen	1
Sasebo to Dairen	1
Sasebo to Tsingtao	1
Shimonosaki (Yoshini and Murotsu) to Fusan	6
Tsuno Shima to Tsushima to Fusan	1
Yobuki (near Fukuoka) to Iki Shima to Tsushima to Fusan	3
Chikusi (near Matsue) to Utsuryo To to Gensan	1
Nagasaki to Tamsui (Formosa)	2
Kagoshima to Naha (Okinawa Jima) to Tamsui	1
Naha to Yap (ex-German cable between Shanghai and Yap)	1
Kamakura (near Yokohama) to Chichi Jima (Ogasawara Gunto) to Guam	1

There are many inter-island cables, both commercial and military. In addition there are undoubtedly some secret cables. The greatest concentration of cables are in the following areas:

North and west coasts of Kyushu
The Inland Sea
Tokyo Bay
Tsugaru Straits (between Hokkaido and Honshu)
Soya Straits (between Hokkaido and Karafuto)

Most of the cables are for telegraph alone. Only a few of the cables, limited to the immediate Japan and Korea areas, are being used for telephone.

Table 18. Length of submarine telegraph and telephone cables in miles (1939)

	Routes	Conductors
Telegraph	9,594	12,347
Telephone	906	9,896
Total	10,500	22,243

<u>New construction</u>. Non-loaded submarine telephone cables between Shimonosaki and Moji, and between Yobuko (near Fukuoka, Kyushu)

and Fusan via Iki Shima and Tsushima were completed in 1939. These cables are the submarine sections of the 1,800-mile Tokyo-Mukden non-loaded telephone cable.

Planned construction. The following new cables have been planned, but it is doubtful if any have been completed due to the adequacy of radio communications and the lack of materials and personnel.

A non-loaded telephone cable between Dairen and Chefoo.

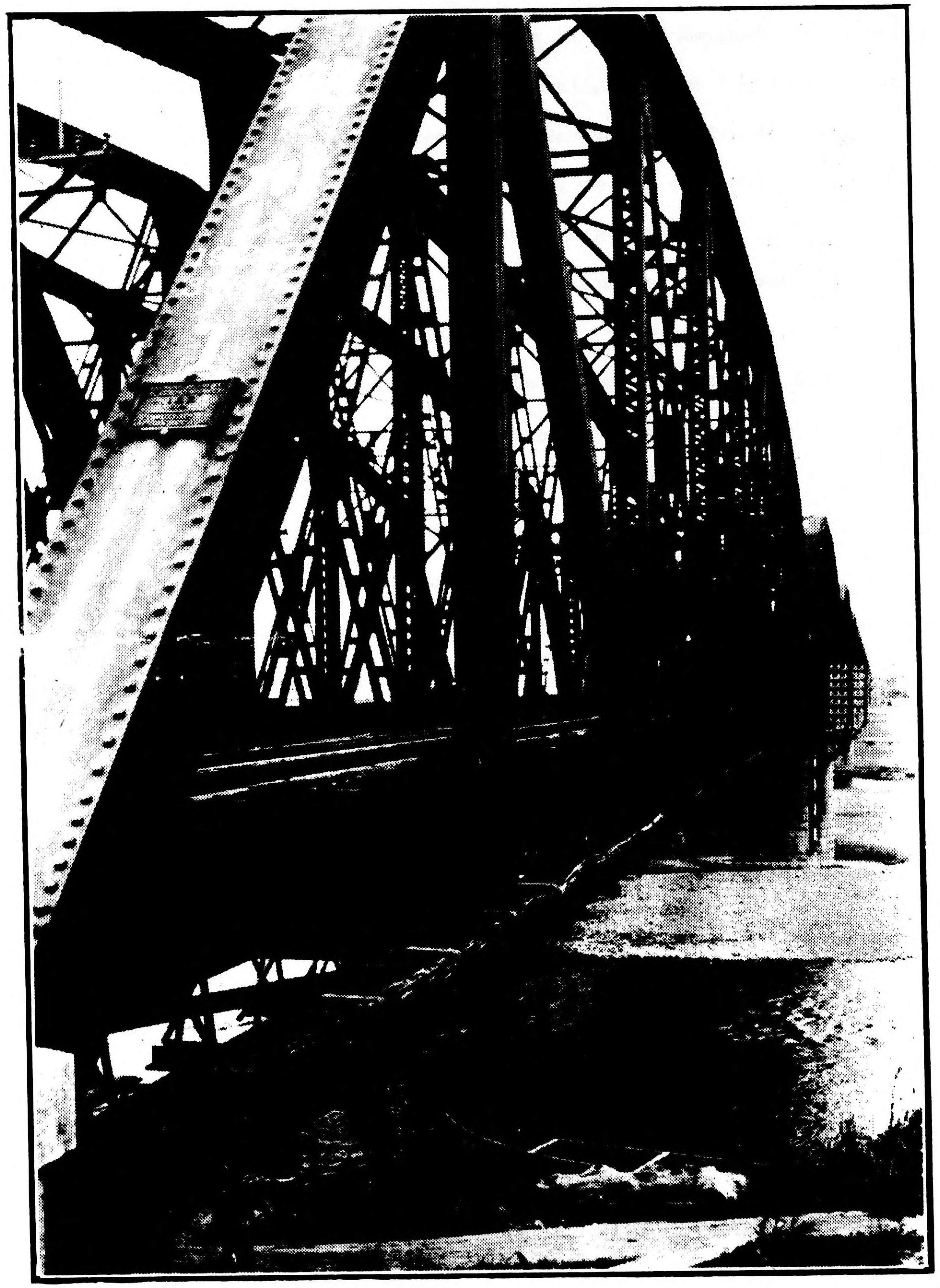
A multi-core submarine cable between Fukuoka, Kyushu, and Shanghai via Saishu To (Quelpart Island).

A cable between Formosa and the Japanese Mandated Islands.

A cable from Formosa to Amoy, to be extended to Canton and Thailand.

A loaded telephone cable between Nagasaki and Shanghai, as part of an Osaka-Shanghai telephone cable. Plans for this system include the laying of short non-loaded submarine cables between Honshu and Shikoku in the vicinity of Osaka, and between Shikoku and Kyushu in the vicinity of Oita. The need for a telephone cable between Osaka and Shanghai has been felt on account of the frequent interruption of radio telephone services due to atmospheric conditions.

Efficiency. Cable operations in Japan have not been entirely satisfactory. There have been many breakages and cablegrams are often very much delayed or mutilated in transmission. During the fiscal year ending March 31, 1938, there was a loss of 124,772 hours in the Japanese cable system due to faults of various kinds. This was an increase of 47,743 hours over the previous fiscal year.



–Armoured Cable Placed on Railroad Bridge Across the Tenryu River.

d. Wire telephoto. Telephoto has been in use in Japan for some time Domestic wire telephoto is available commercially between Tokyo and Osaka. Three wire telephoto circuits between Tokyo and Fukuoka, Kyushu, formerly the property of the three great news agencies, are now no doubt in Government service. The new non-loaded telephone cable to Manchuria is used for the transmission of telephotos between North China, Manchuria, Korea, and Japan. Results are said to be highly satisfactory.

4. Experimental work. -- With the intention of making Japan independent of foreign technicians and source of equipment, the Japanese have been conducting serious research in the field of electrical communications since 1919. This objective has been realized. Most of the research has been centered in the laboratories of the Ministry of Communications, the International Telecommunications Company, the Japan Boradcasting Corporation, and the Imperial Universities at Sapporo, Sendai, Tokyo, Osaka, Kyoto, Fukuoka, and Taihoku. Government subsidies are available for serious and successful workers. Young men have been sent abroad to master foreign techniques.

No great amount of original developmemt has appeared but the Japanese have been very successful in the practical adaption of foreign inventions. Modern Japanese electrical apparatus is distinguished by practical and well-planned design. In particular it should be noted that the various field radio sets used by the Japanese Army are good examples of sturdy, foolproof design.

Some of the problems that have recently attracted the attention of Japanese research engineers are listed below:

The suppression of noise and interference and the decrease of distortion in all frequency bands.

Filter networks, wave separators, wave selectors, use of quartz crystal filters, quartz resonators, band pass filters in superheterodyne receivers, tone signal reception, amplifilters, amplifilter compressors, duplex feedback systems.

Voice amplifying systems, wide-band, high-gain stabilized amplifiers, ultra-high frequency amplifiers.

Carrier waves in relaying systems, improvement of relay broadcasting.

Stepping up frequencies and the reception of high frequencies.

Frequency stability of ultra-short wave transmitters and receivers by the use of quartz crystal control and the Tourmalin short-wave-oscillator.

Frequency modulation.

Magnetic recording.

Supersonic wave.

Vacuum tubes, Braun tubes.

Electron oscillators, micro-wave receivers, ultra-short wave simultaneous telephony as exemplified by the radio channel across Tsugaru Straits between Hokkaido and Honshu.

Measurement of high frequency field intensity.

Submarine communications; the Japanese claim to be able to carry on radio telephone communications between submerged submarines, using supersonic waves. Conversations at a distance of two and a half miles are possible, but a power of four kilowatts is necessary.

The effect of short waves and ultra-short waves on organisms.

Telegraph relay systems. improvement of automatic transmitters, measurement of distortion.

Simplified carrier telephone sets.

Frequency inversion in telephone systems.

Simplified common battery telephone exchanges, automatic toll switching systems, automatic telephone exchange equipment, rural automatic telephones, telephone installation in metropolitan telephone areas.

Troubles of secondary batteries, improvement of telephone receivers, improvement of efficiency of telephone equipment.

Amplifiers for cable loss compensation - especially in long-distance submarine cables.

Non-loaded cables.

Carrier cables, coaxial cables, star squad cables for exchange areas.

Paper-insulated, lead-covered multi-cored submarine cables for non-lpaded carrier systems.

Location of faults in carrier systems.

Terminal station equipment.

Development of an aviation type direct reading altitude meter by the electrical wave reflection method.

Electric sound location.

Radio beacons, radio compasses, remote control by radio.

Improvement of materials of high magnetic quality.

Movable radio equipment, military and naval equipment using voice and supersonic waves.

5. <u>Shortages</u>. — <u>a</u>. <u>Materials</u>. — Japan is now suffering a shortage of certain basic materials necessary in the production of communications equipment, especially copper. Japan's consumption of copper is thought to be 200,000 metric tons annually, of which 150,000 tons

can be supplied by Japan and occupied areas. This leaves a serious deficit of 50,000 tons. However, as Japan's stockpiles of copper are estimated at 200,000 tons, present stocks will be able to make up this deficit until 1945.

Aluminum and soft steel are available as substitutes for copper. Such substitutes as aluminum and iron for copper, and synthetic materials for metals are used very extensively in the cheaper grade of instruments, such as popular radio receiving sets.

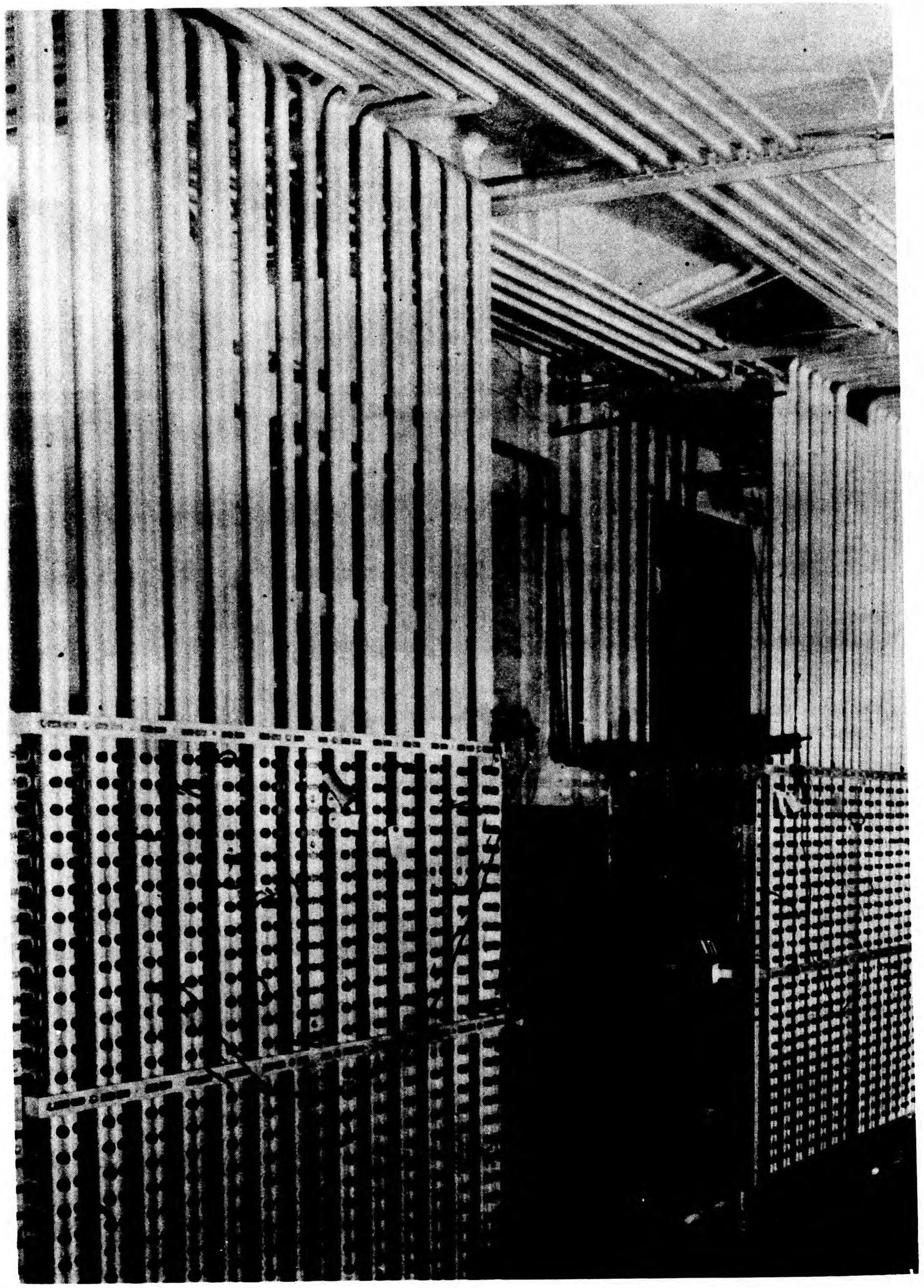
Personnel. The demands of war have left a shortage of manpower in the non-military communication system. Efforts to combat this shortage include the drafting of disabled war veterans for communications work.

b. Manufacturing facilities. -- The three companies listed below manufacture 95 percent of all radio equipment and 75 percent of all electrical telephone equipment. It should be noted that the main factories of these companies are located in Tokyo or Kawasaki, the industrial area between Tokyo and Yokohama.

Name of company	Products	Location of works
Tokyo Electric Radio Co., Ltd.	Radio and television apparatus, instruments, tubes, etc.	72 Horikawa Machi, Kawasaki, Kanagawa Pref.
Nippon Electric Co., Ltd.	Telephone, radio, and communication equipment for military use, electrical instruments.	2 Shikoku Machi Shiba Ku, Tokyo
Oki Electric Co., Ltd.	Telephone and radio equipment; communications and signalling apparatus, lamps, tubes, etc.	1 Nishi Shibaura 4-chome, Shiba Ku, Tokyo.

The companies listed below manufacture some items used in the electrical communications system.

(岡福)盤換切線中空 following p. 30



RESTRICTED Antenna switching center, Fukuoka

Name of company	Products	Location of works
Furukawa Electric Co., Ltd.	Wire, cable accessories, batteries, etc.	23, Nishi Hiranuma Cho 4-chome, Kanagawa Ku, Yokohama. Branches at: 500 Osata Machi, Moji, Fukuoka Pref. Nishino Machi, Higashi Mukojima, Amagasaki, Hyogo Pref.
Sumitomo Electric Wire and Cable Works, Ltd.	Wire, cable, accessories, alloys for dies and tools	60 Okijima Minamino Cho, Konohana Ku, Osaka. Branch factory at: 13 Tsuruhama Dori 3-chome, Taisho Ku, Osaka.
Fujikura Electric Cable Works, Ltd.	Wire, cable, accessories.	4 Heikyo Cho 1-Chome, Taisho Ku, Tokyo.
Showa Wire and Cable Works, Ltd.	Wire, Cable, accessories.	2482 Higashi Watarida 3-chome, Kawasaki, Kanagawa Pref.
Nippon Electric Cable Co.	Wire, cable, accessories.	5 Terajima Cho 2-chome, Mukojima Ku, Tokyo.
Tokyo Wire Manufacturing Co.	Wire and cable	65 Furukawa Dori, Kawasaki, Kanagawa Pref.
Yuasa Storage Battery Co.	Dry cells, storage batteries, chargers.	Takatsuki Machi, Osaka Pref.
Kana Electric and Manufacturing Co.	Generators, motors, pumps, High frequency generators for radio.	12 Kiyokawa Cho 3-chome, Asakusa Ku, Tokyo.

c. Maintenance and repair. The Japanese are known for their tendency to neglect the maintenence of their facilities, with the result that costly repairs involving much loss of time are frequently necessary. With the increasing shortage of materials and personnel, this tendency is becoming especially serious.

d. <u>The communications network.</u> — The communications network of Japan in general follows the main coastal railways and highways. Telephones cables, as well as telegraph and power lines, are often carried across large rivers, such as the Aka Gawa, Fuji Kawa, Oi Kawa, Tenryu Kawa, Kiso Gawa, Ibi Gawa, Seta Gawa, and the Yodo Gawa, on railway or highway bridges. Communications and transportation lines are also vulnerable where they follow the many stretches of mountainous coastline.

Vulnerable points on any toll cable system are the repeater stations. In the case of the Tokyo-Mukden non-loaded cable two key repeater stations on the Fukuoka-Fusan submarine section are located at Gonoura at the southwestern part of Iki Shima, and at Osaki, on the northwestern extremity of the southern island of Tsushima.

Landings of important submarine cables are concentrated in relatively small areas, such as: (a) The Wakkanai area of northern Hokkaido; (b) The Hakodate and Aomori areas on the Tsugaru Straits; (c) The Tokyo Bay area; (d) The Moji-Shimonoseki area; (e) The Yokuko (near Fukuoka, northern Kyushu) area; (f) The Sasebo and Nagasaki areas, western Kyushu; and (g) The Kagoshima area, southern Kyushu. Some important cables land on outlying islands, such as: Chichi Jima, on the Tokyo-Guam cable; Iki Shima and Tsushima on the Fukuoka-Fusan cables; and Amani O Shima, Okinawa Jima, and Ishigaki Jima on the Kagoshima-Formosa cable.

Important radio stations are often located on outlying islands without other means of rapid communications. The repair or reconstruction of these stations would be difficult. The most important of such stations are located on Paramushiro To in the northern Kurile Islands, Minami Tori Jima (Marcus Island) in the Nampo Shoto, and various of the Mandated Islands Other such stations are located in the Kurile Islands, Nansei Shoto (Luchu

islands), and the Nampo Shoto (islands south of Tokyo, including the Ogasawara Gunto and Kazan Retto).

The powerful short-wave transmitting and receiving stations used for overseas radio telegraphy or telephony are all located near Tokyo and Osaka. These stations are: (a) The Oyama transmitting and Fukuoka receiving stations, with the controlling office at the Tokyo Central Telephone Office; (c) the Yosami transmitting and Yokkaichi receiving stations, with the controlling offices at the Osaka Central Telegraph Office and at the Nagoya Central Post Office; and (d) the Semayama transmitting and Ono receiving stations, with the controlling office at the Osaka Central Telegraph Office.

e. <u>Radio broadcasting.</u> The studios of the 150-kilowatt Tokyo long-wave broadcasting station JOAK are located in the Broadcasting House, near Hibiya Park, with the transmitting station nearby. The studios for all short-wave radio programs originating in Japan are also located in the Broadcasting House, although the short-wave transmitting station is some distance north of Tokyo at Nasaki. A large part of the programs of stations throughout the Japanese Empire and occupied areas is relayed or rebroadcast from Tokyo. Destruction of the Tokyo broadcasting installations or of the telephone cables leading from Tokyo would have a serious effect on Japan's broadcasting system.

APPENDICES

Appendix I

FIXED RADIO STATIONS

1. General. There are many fixed radio stations everywhere in Japan, as shown in figure 1. These stations are used for communications an(aids to navigation, and are classified according to their primary function as follows: (1) Fixed stations, for station - to - station communications; (2) coastal stations, for station - to - ship communications; (3) aeronautical stations, for station - to - aircraft communication; (4) radio direction-finder stations; (5) radio beacons; (6) radio stations broadcasting weather information; and (7) meteorological observation stations. The last four classes, as aids to navigation, undoubtedly do not function normally in times of war. However, the location of all radio equipment is significant. Many stations have more than one classification, as is shown in figure 1. Known details of fixed radio stations as of 1941, are listed in the following tables. Stations whose functions are not known are classed as fixed stations. It must be kept in mind that, owing to Japan's policy in regard to her communication facilities, information is incomplete. Secret stations probably exist in all strategic areas.

2. Radio station legend - types of omission, and services rendered.

A0 - Waves of which the successive oscillations are identical when the steady state is reached.

A1 - Telegraphy on pure continuous waves. A continuous wave which is keyed according to a telegraphic code.

A2 - Modulated telegraphy. A carrier wave modulated at one or more audible frequency or frequencies or their combination, with the carrier wave being keyed according to a telegraph code.

A3 - Telephony. Waves resulting from the modulation of a carrier wave by frequencies corresponding to the voice, to music, or to other sounds.

B - Waves composed of successive series of oscillations the amplitude of which, after attaining a maximum, decreases gradually, the wave trains being keyed according to a telegraph code.

Table 1. Fixed radio stations in Japan proper
(Stations performing a station-to-station service)

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Aino: See Nagasaki (Aino)							
Amagasaki, Hyogo Pref.		34°42'30"N., 135°25'30"E. (approx.)			A3		Radio telephone service reported available.
Anori Zaki Mie Pref.		34°21'45"N., 136°54'45"E.					Radio station reported at the lighthouse.
Aomori, Aomori Pref.	JGU2	40°50'13"N., 140°43'21"E.	270	1111	A1	0.25	
	JGU3	"	410	732	A2	0.1	
	JGJ	"	600	500	-	0.25	
	JGJ	"	1100	272.7	A1	0.25	
Aomori Railway Station	-	"	232	1293	A3	0.125	
Awa Shima, Yamagata Pref.	JQZ	38°27'55"N., 139°14'50"E.	1750	171.4	A1	0.1	
Chichi Jima, Ogasawara Gunto, Nampo Shoto	JRS	27°05'40"N., 142°12'00"E.	85.5	3508	A1	1	Radio telephone service reported installed.
China, Okinoerabu Shima, Nansei Shoto	JQP	27°21'N., 128°30'E. (approx.)					
Chinzei, Kakeroma Shima, Nansei Shoto	JQO	28°06'00"N., 129°19'30"E. (approx.)					
Choshi, Chiba Pref.	JCS	35°45'29"N., 140°45'16"E.	94.5	3175	A1	3	Normal range 550 nautical miles, maximum 4,000.
	JPT		5250	57.14	A1	0.5	
	JCT		8200	36.59	A1	0.5	
	JPT		11145	26.92	A1	.10	
	"		13160	22.80	A1	0.5	
	"		17360	17.28	A1	1	
Esutoru, Karafuto	JTX	49°03'59"N., 142°02'47"E.	95	3158	A1	1	Planned 1939
			2770	108.3			
			3220	93.17			
Fukae (Fukue), Fukae Jima Nagasaki Pref.	JECA	32°41'10"N., 128°50'30"E. (approx.)					Radio towers observed
Fukui, Fukui Pref.		36°05'N., 136°12'E. (approx.)			A3		Radio telephone service reported available.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Fukuoka, Fukuoka Pref.	JXF	33°38'35"N.,	5460	54.95	A1	0.5	20 other frequencies (corresponding call letters not given) are reported used for governmental purposes. Perhaps Tokyo (Fukuoka)
	JXF	130°25'40"E.	6600	45.45	A1	0.5	
	JXF		9380	31.98	A1	0.5	
	JIZ	33 42'37"N.,	8710	34.44	A1,A2	2	
	JIZ2	130 26'17"E	13580	22.09	"	2	
Fukuoka, Saitama Pref.: See Tokyo (Fukuoka)							
Funabashi: See Tokyo (Funabashi)							
Goshoura, Kumamoto Pref.	JQJ	32°20'15"N., 130°20'10"E.					
Hachijo Jima, Izu Shichito, Nampo Shoto	JXT	33°06'30"N.,	5167.5	58.06	A1	0.5	
	JXT	139°47'30"E.	9132.5	32.85	A1	0.5	
Hachinohe, Aomori Pref.		40°15'20"N., 141°34'00"E. (approx.)					Conspicuous radio masts reported at Tatega Hana.
Haha Jima, Nampo Shoto	EUC	26°38'N.,	3730		A1,A2	0.5	Station at the Central Weather Observatory. Meteorological Station
	EUC	142°10'E.	6755		A1,A2	0.5	
	EUC		9135		A1,A2	0.5	
Hahajima, Okino Shima, Ehime Pref.	JQU	32°44'N., 132°34'E. (approx.)					
Hakodate, Oshima Prov., Hokkaido	JHK	41°46'09"N.,	95	3158	A1	1	
	JKZ	140°50'19"E.	600	500		0.25	
	JKZ		1100	272.7	A1	0.25	
Hakodate (Kunebetsu), Oshima Prov., Hokkaido	JGV2	41°49'30" 140°40'35"E.	270	1111	A1	0.25	Radio telephone to Ishizaki, Aomori Pref., available.
	FC		410	732	A2	0.1	
Hakodate Railway Station, Hokkaido		41°46'50"N., 140°44'00"E.	313	958	A3	0.125	
Hakone, Kanagawa Pref.	JXH	35 10'40"N., 139 00'40"E.	225	1333	A1	0.5	
Haranomachi: See Tokyo (Haranomachi)							

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Hiroshima. Hiroshima Pref.	JHL	34°23'30"N.,	4110	72.99	A1	0.5	
	JHL	132°27'15"E.	5160	58.14	A1	0.25	
	JHL		8120	36.95	A1	0.25	
Hisagan Jima, Goto Retto, Nagasaki Pref.	JQH	33°42'N., 129°52'E. (approx.)					
Horomushiro (Ruisan). Kurile Is.	JHH	50 29'20"N.,	96.5	3110	A1	1	Normal range 550 nautical miles, maximum 1,800.
	JHI	156 07'48"E.	4490	66.82	A1	0.5	
	JHI		6120	49.02	A1	0.25	
	JHI		8860	33.86	A1	0.5	
Ichinowatashi, Araito Jima, Kurile Is.		50°52'N., 155°32'E. (approx.)					Private station owned by the Hokkaido United Fishing Co.
Isahaya: See Nagasaki (Isahaya)							
Ishigaki Jima, Nansei Shoto	JGL	24°20'00"N., 124°09'30"E. (approx.)	75	4000	A1	0.75	Meteorological Stations. Conspicuous radio masts near the landing field.
Ishizaki, Aomori Pref.	JKK	41°13'N.,	72000	4.167	A1,A3	0.03	For radio telephone to Hakodate.
	JKK	140°38'E.		4.054	A1,A3	0.03	
Iwa (Zozo), Kumamoto Pref.	JQM	32°34'N., 130°30'E. (approx.)					
Iwatsuki: See Tokyo (Iwatsuki)							
Izuhara, Tsushima	JXI	34°12'10"N., 129°17'30"E.	235	1277	A1	0.5	
Kagoshima, Kagoshima Pref.	JKF	31°38'15"N.,	99	3030	A1	1	Range about 1,000 miles
	JKG	130°34'25"E.	103	2913	A1	1	
	JKH		3800	78.95	A1	0.5	
	JKI2		4055	73.98	A1,A3	0.5	
	JKA		4260	7042	A1	0.5	
	JKC		7450	40.27	A1	0.5	
	JKI3		9055	33.13	A3	0.5	For radio telephone service to Naze, Amami O Shima
	JKD		9180	32.68	A1	0.5	
	JKE		9960	30.12	A1	0.5	
	JKI4		12105	24.78	A1,A3	0.5	

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Kakumabetsu, Paramushio To, Kurile Is.		50°22'N., 155°37'E. (approx.)					Private station owned by former Japanese-American Fishing Co.
Kameyama, Mie Pref.	JXK	34°51'40"N 136°27'25"E.	215	1395	A1	0.5	
Kamezu, Tokuno Shima, Nansei Shoto	JIY JIY	27°45'N., 129°02'E. (approx.)	3970 6970	75.57 43.04	A3 A3	0.1	
Kami Jima, Mie Pref.	JQB	34°33'N., 136°59'E. (Approx).					
Kanazawa, Ishikawa Pref.	JKV JKV JKV	36°34'10"N., 136°39'40"E.	5360 7400 8000	55.97 40.54 37.50	A1 A1 A1	0.25 0.25 0.25	
Kashiwabara Wan, Paramushiro To, Kurile Is.	JKZ JKZ	50°41'N., 156°09'E. (approx.)	1650 1700	181.8 176.5	A3 A3	0.05 0.05	Private station owned by the Northern Kurile Fishing Co.
Kashiwa Jima, Ehime Pref.	JETA	32°46'00"N., 132°37' 30"E. (approx.)					
Kataoka Wan, Shimushu To. Kurile Is.	JKY	50°43'N., 156°12'E. (approx.)	1650 1700	181.8 176.5	A3 A3	0.05 0.05	Private station owned by the Northern Kurile Fishing Co.
Kemikawa: See Tokyo (Kemikawa)							
Kobe, Hyogo Pref.		35°41'00"N., 135°11'00"E.			A3		Radio telephone reported available. Marine Observatory Weather broadcasts.
Kobe	JTJ	135°11'00"E.	75	4000	A1	3	
Kokutan Zaki, Shimushu To, Kurile Is.	EUY	50°58'N., 156°29'E. (approx.)	1865	160.9		0.03	Located at the lighthouse. Meteorological Station
Komuro: See Tokyo (Komuro)							
Koniya, Amami O Shima, Nansei Shoto	JQN JQN	28°09'N., 129°19'E. (approx.)	3830 6970	78.33 43.04	A3 A3	0.05 0.05	

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Kosu Shima, Izu Shichito, Nampo Shoto	JQW	34°14'N., 139°10'E. (approx.)					Two steel masts observed at Kozushima Mura.
Kuji, Amami O Shima, Nansei Shoto	JKF JHC JHC	28°14'10"N., 129°19'00"E.	4200 5400 9780	71.43 55.56 30.67	A1 A1 A1	- 0.25 0.25	
Kume Shima, Nansei Shoto	JHB	26°18'50"N., 126°47'40"E.	1850	162.2	A1	0.05	
Kure, Hiroshima Pref.		34°15'N., 132°33'E. (approx.)					Navy radio station.
Maizuru, Kyoto Pref.	JMZ	35°30'45"N., 135°18'30"E.	300 600 900 3500	1000 500 333.3 85.71		5 5 5 5	Naval radio station, open to public. Normal range 500 miles, maximum 1,250.
Makurazaki, Kagoshima Pref.		31°16'N., 30°18'E.					Radio towers observed.
Me Shima, Kumamoto Pref.	JGI	31°59'35"N., 128°21'20"E.	185	1622	A1	0.25	
Mikura Jima, Izu Shichito, Nampo Shoto	JQX	33°52'N., 139°37'E. (approx.)					Station at the post office, Sato Mura.
Minami Daito Jima, (Minami Oagari Jima), Nansei Shoto	JPX	25°51'00"N., 131°15'00"E.	109	2752	A1	0.4	Normal range 200 nautical miles, maximum 600. Conspicuous tower on hill. Private station.
	JYU	25°51'N., 131°15'E. (approx.)					
Minami Tori Jima, (Marcus Island) Nampo Shoto		24°14'N., 154°00'E.					Radio masts have been observed.
Miyake Jima, Izu Shichito, Nampo Shoto							Station with at least one steel tower believed to exist.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters.	Type	Power in kw.	Remarks
Miyako Jima, Nansei Shoto		24°48'N., 125 18'E. (approx.)	4400 7685 10770	68.18 39.04 27.86	A3 A3 A3	0.5 0.5 0.5	Radio telephone service to Tarama Jima reported available.
Miyata, Kumamoto Pref.	JQI	32°14'N., 130°15'E. (approx.)					
Moji, Fukuoka Pref.		33°56'48"N., 130°58'08"E.	276	1087	A3		Radio telephone for shore-to-ship conversations available. Radio masts at post office.
Moro Saki, Aichi Pref.	JQD	34°42'N., 136°58'E. (approx.)					
Moyoro, Paramushiro To, Kurile Is.		50°12'N., 155°17'E. (approx.)					Private station owned by the Northern Pacific Fishing Co.
Murakami Zaki, Shimushu To, Kurile Is.		50°50'N., 156°22'E. (approx.)					Private station.
Nada, Awaji Shima, Hyogo Pref.	JQR	34°12'N., 134°48'E. (approx.)					
Nagasaki (Aino), Nagasaki Pref.	JOS JOR JOR JOR JOR	32°48'05"N., 130°09'25"E.	95 5380 8740 12700 17320	3158 55.76 34.32 23.62 17.32	A1 A1 A1 A1 A1	3 1 1 1 1	Transmitting station.
Nagasaki (Isahaya). Nagasaki Pref.		32°50'N., 130°02'E. (approx.)					Receiving and redispatching station.
Nagoya (Yokkaichi). Mie Pref.	JNZ	34 58'15"N., 136 37'25"E.	93.5	3209	A1	0.5	Receiving station of the Middle Japan Radio Central located here; controlling office in Osaka, formerly Nagoya.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Nagoya (Yosami): See Osaka (Yosami)							
Naha, Okinawa Jima, Nansei Shoto	JCF JCE JCA JCG2 JCC JCB JCD JCG3 JCG4	26°12'10"N., 127°41'10"E.	89 1850 3220 3940 4930 5120 7530 9360 10770 13435	3370 162.2 93.17 76.14 60.85 58.59 39.84 32.05 27.86 22.33	A1 A1 A3 A1 A1,A3 A1 A1 A1 A3 A1,A3	1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	Normal range 600 nautical miles, maximum 1,000. (station JGH at Meteorological Observatory)
Nara, Nara Pref.		34°41'N., 135°50'E. (approx.)			A3		Radio telephone service reported available.
Naru Shima, Goto Retto, Nagasaki Pref.	JQG	32°51'N., 128°56'E. (approx.)					
Nasaki: See Tokyo (Nasaki)							
Naze, (Nase) Amami O Shima, Nansei Shoto.	JGH	28°23'N., 129°30'E. (approx.)	75 4070 6935 9290	4000 73.71 43.26 32.29	A1 A3 A3	0.75	Meteorological Observatory Radio telephone service to Kagoshima reported available.
Nemuro, Nemuro Prov., Hokkaido	JKL JKL	43°25'31"N., 144°28'55"E.	3125 3640	96 82.42	A1,A3 "	0.05 "	
Niigata, Niigata Pref.	JQY JQY	37°55'10"N., 139°03'15"E.	1750 4930	171.4 60.85	A1 A1	0.1 0.1	Radius 110 miles.
Noboritate, Kumamoto Pref.	JQK	32°35'30"N., 130°26'00"E.					
Numa Jima, Hyogo Pref.	JQS	34°10'N., 134°49'E. (approx.)					Station built in 1923. No details known.
Oita, Oita Pref.	JIT	33 14'10"N., 131°40'30"E	95	3158	A1	1	
Okino Daito Jima, (Okino Oagari Jima), Nansei Shoto	JSA	24°28'10"N., 131°11'00"E. (approx.)					Private radio station near the northwestern end of the island, with a conspicuous tower. Normal range 450 miles, maximum 1,300.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Ominato, Aomori Pref.		41°16'N., 141°09'E. (approx.)					Navy maintains high frequency direction finder radio station.
Ono: See Osaka (Ono)							
Osaka (Hirano), Osaka Pref.	JNY	34°37'30"N., 135°32'30"E.	1750	171.4	A1	0.05	
	JNZ2		4045	74.17	A1,A2,A3	0.1	
Osaka (Ono). Hyogo Pref.		35°50'N., 134°56'E. (approx.)					New receiving station of the Middle Japan Radio Central (controlling office Osaka) for overseas radio telegraph and radio telephone reported here.
Osaka (Sakai), Osaka Pref.	JES	34°31'30"N., 134°31'00"E.	4705	63.76	A1,A2	2	At least 28 additional frequencies varying from 31.2 to 16240 kcs. (call letters not listed) are used by the Osaka stations for governmental purposes.
	JET		4865	61.66	A1,A2	2	
	JEU		5105	58.77	A1,A2	2	
	JEV		6087	49.28	A1,A2	2	
	JEN		6755	44.41	A1,A3	2	
	JER		8550	35.09	A1,A2	2	
	JEW		9295	32.28	A1,A2	2	
	JEQ		10875	27.59	A1,A2	2	
	JEP		11665	25.72	A1,A2	2	
	JEX		12070	24.86	A1,A2	2	
	JEO		13140	22.83	A1,A2	2	
Osaka (Semayama, Hirano), Osaka Pref.	JEA	34°37'28"N., 135°32'45"E.	97	3092	A1	1	New transmitting station of the Japan Radio Central (controlling office Osaka) for overseas radio telegraph and radio telephone, supplementing the Yosami station, reported here.
	JXO		240	1250	A1	1	
	JEB		4480	66.96	A1	2	
	JEC		4610	65.08	A1	1	
	JED		5780	57.90	A1	4	
	JEE		7310	41.04	A1	1	
	JCF		7780	38.56	A3	5	
	JEF		8020	37.41	A1	4	
	JEG		8960	33.48	A1	1	
	JEM		9755	30.75	A1,A2	1	
	JEI		10120	29.64	A1	2	
	JGF2		10840	27.68	A3	5	
	JEJ		11560	25.95	A1	4	
	JGF3		13480	22.26	A3	5	
	JEK		13510	22.21	A1	1	
	JEL		14660	20.46	A1	2	
	JGF4		15535	19.31	A3	5	
	JGF5		19040	15.76	A3	5	
	JJX		24130	12.43	A1,A2	10	
	JJX2		27030	11.10	A1,A2	10	
	JJX3		30030	9.990	A1,A2	10	

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Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Osaka (Yosami)		34°58'15"N., 137°01'18"E.					Transmitting station of the Middle Japan Radio Central (controlling office Osaka, formerly Nagoya) for radio telegraph services to Europe and southeastern Asia.
	JED		17.44	17200	A1	50	For service to Europe.
	JUC		4900	61.22	A1	10	For service to China.
	JES		5100	58.82	A2	40	For service to Europe.
	JUA		5770	51.99	A1	10	For service to China.
	JUC2		5827.5	51.48	A1	10	For service to China.
	JEM		5980	50.17	A1	10	For service to Europe.
	JAK		6700	44.78	A1	1	For service to Philippines.
	JUG		6790	44.18	A1	20	For service to Syria.
	JEL		6810	44.05	A1	10	For service to Europe.
	JEE2		7815	38.39	A1,A2	20	For service to Europe.
	JEE		7820	38.36	A1	5	For service to Europe.
	JES2		7980	37.59	A2	35	For service to Europe.
	JAQ		8050	37.27	A1,A2	20	For service to India.
	JAQ2		8055	37.24	A1,A2	20	
	JAL		8920	33.63	A1	1	For service to Philippines.
	JEA		8980	33.41	A1	20	For service to Europe.
	JUK		9025	33.24	A1,A2	1	For service to China.
	JAI		9215	32.56	A1	10	For service to French Indo-China, and Thailand.
	JAO		9782.5	30.67	A1	20	For service to Syria.
	JEB		10160	29.53	A1	5	For service to Europe.
	JES3		10925	27.46	A2	30	For service to Belgium.
	JUE		11520	26.04	A1	20	
	JUK		11915	25.18	A1	1	For service to China.
	JUS		12010	24.98	A1,A2	1	For service to China.

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Station	Call letters	Location	Fre-quencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Osaka (Yosami), Aichi Pref. (Cont'd)	JUK		12037.5	24.92	A1,A2	1	For service to Europe.
	JNI		12200	24.59	A1	5	
	JAF		13400	22.39	A1	10	For service to N.E.I.
	JNB2		13875	21.62	A1,A2	20	
	JNB		13880	21.61	A1		For service to Europe.
	JNJ2		13940	21.52	A1,A2	20	
	JNJ		13945	21.51	A1,A2	20	For service to Europe.
	JAM		14840	20.22	A1	1	For service to Philippines.
	JNS4		14970	20.04	A1,A2	25	For service to Europe.
	JNK2		14975	20.03	A1,A2	1	
	JNF		15720	19.08	A1	5	For service to Europe
	JNQ		15790	19.00	A1	20	For service to Italy.
	JAJ		15840	18.94	A1	10	For service to Fr. Indo-China and Thailand.
	JAW		17400	17.24	A1	20	For service to Syria.
	JAG		17840	16.82	A1	10	For service to N.E.I.
	JAG		17885	16.77	A1	10	
	JNC		17960	16.70	A1	20	For service to Europe.
	JNO2		18005	16.66	A1,A2	20	
	JNT		18355	16.34	A1,A2	40	For service to Asia.
	JAS		18360	16.34	A1,A2	20	For service to India.
	JNT2		18365	16.34	A1,A2	40	For service to Asia.
	JNS5		18445	16.26	A2	20	For service to Europe.
	JNN		19000	15.79	A1	5	For service to Europe.
	JNN2		19045	15.75	A1,A2	20	
	JNG		19120	15.69	A1	5	For service to Europe.
Ose Zaki: See Tomie							Ose Zaki station discontinued.
O Shima, Izu Shichito, Nampo Shoto.	JLI	34°47'40"N., 139°22'30"E.	300	1000	A1,A2	0.35	At Kazehaya Light Station; Normal range 100 miles, maximum 170.
			375	800	A1,A2	0.35	
			500	600	A1,A2	0.35	
Otaru, Shiribeshi Prov., Hokkaido.	JNY	43°12'N., 141°00'E. (approx.)	109	2752	A1	1	

Station	Call letters	Location	Fre-quencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Otchishi (Ochiishi), Nemuro Prov., Hokkaido.	JOA	43°10'00"N., 145°30'48"E.	57.5	5220	A1	5	Normal range 550 nautical miles, maximum 3,000. Direct circuit with Petropavlovsk, receiving station at Nemuro.
	JOB		90	3333	A1	3	
	JOD		185	1622	A1	1	
	JKR		5300	56.60	A1	0.25	
	JKS		8660	34.64	A1	0.25	
	JKT		12755	23.52	A1	0.25	
	JKU		17220	17.42	A1	1	
Otomari, Karafuto	JTW	46°36'40"N., 142°46'46"E.	72	4170	A1	3	Normal range 450 nautical miles, maximum 1,500. Conspicuous masts on hill northeast of Taushima Misaki. Ultra-short-wave radio telephone to Wakkanai reported.
Oyama: See Tokyo (Oyama)							
Paramushiru: See Horomushiro							
Sakata, Yamagata Pref.		38°54'50"N., 139°50'00"E. (approx.)	34000	8.823	A3		Ultra-short-wave radio telephone to Tobi Shima.
			39000	7.692			
Sapporo, Ishikari Prov., Hokkaido.	JPS	43°03'30"N., 141°21'25"E.	3715	80.75	A1	0.5	
	JPS		5040	59.52	A1	0.5	
	JPS		7900	37.97	A1	0.5	
	JPS		10320	29.07	A1	0.5	
Sasebo, Nagasaki Pref.	JMG	33°09'N., 129°42'E. (approx.)					Navy radio station.
Semayama: See Osaka (Semayama)							
Shakotan, Shikotan Jima, Kurile Is.		43°51'50"N., 146°49'30"E. (approx.)					Radio station reported.
Shana, Etorofu Jima, Kurile Is.	JSH	45°13'46"N., 147°53'04"E.	185	1622	A1	0.25	
	JSH2		3250	92.31	A1,A3	0.1	
	JSH3		3480	86.21	A1,A3	0.1	

Station	Call letters	Location	quencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Shimizu, Shizuoka Pref.		35°01'N., 138°29'E. (approx.)					2 conspicuous triangular radio masts reported near the harbor.
Shimoda, Shizuoka Pref.	JQV	34°40'15"N., 138°57'00"E. (approx.)					
Shimotsui, Okayama Pref.	JSX	34°26'10"N., 133°48'25"E.	109	2752	A1	1	Normal range 300 nautical miles, maximum 1,000.
Shino Shima, Aichi Pref.	JQE	34°40'15"N., 137°00'10"E. (approx.)					
Shiono Misaki, Wakayama Pref.	JSM	33°26'00"N., 135°45'45"E.	97.5	3077	A1	1	Normal range 450 nautical miles, maximum 1,300. Located near a white circular tower.
Suribachi Wan, Paramushiro To, Kurile Is.	JGJ	50°11'N., 155°44'E. (approx.)	170 6030 8750	1765 497.5 34.29	A1 A1 A1	0.25 0.1 0.1	Located at the meteorological observatory.
Tarama Jima, Nansei Shoto		24°40'N., 124°42'E. (approx.)			A3		Radio telephone service to Miyako Jima reported.
Toba, Mie Pref.	JQA	34°29'00"N., 136°50'30"E. (approx.)					
Tokyo (Fukuoka), Saitama Pref.	JUZ	35°52'39"N., 139°31'12"E.	93.5	3209	A1	1	Receiving station of the Eastern Japan Radio Central (radio telegraphy, controlling office Tokyo) located here.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Tokyo (Funabashi), Chiba Pref.	JJC JJC	35°43'00"N., 139°58'20"E.	26 29	11540 7690	A1 A1		Navy station located here, normal range 1,500 miles, maximum 5,000. Receiving station at Navy Ministry.
Tokyo (Haranomachi), Fukushima Pref.	JAA	37°37'59"N., 140°59'10"E.	19.6	15300	A1		Normal range about 5,000 miles. Formerly long-wave transmitting station to U.S.A. for the Eastern Japan Radio Central, superseded by Oyamn.
Tokyo (Hibiya Park), Tokyo Pref.	JUY JUY2	35°41'30"N., 139°46'10"E.	1750 4035	171.4 74.35	A1 A1,A2, A3	0.05 0.1	
Tokyo (Iwatsuki), Saitama Pref.		35°56'50"N., 139°41'25"E.					Receiving station used in conjunction with the Kemikawa transmitting station.
Tokyo (Kemikawa), Chiba Pref.		35°38'35"N., 140°04'40"E.					Messages received from internal stations via Iwatsuki rebroadcast to coastal vessels.
	JYH		36.5	8220	A1	15	
	JYI		54.5	5510	A1	5	
	JYA		77	3896	A1	3	
	JYQ		92	3261	A1	1	
	JXS		210	1429	A1	5	For station-to-aircraft service.
	JJY		4000	75.00	A0	5	
	JYF		5240	57.25	A1	1	
	JIP		5415	55.40	A1,A2	2	
	JYV		5470	54.84	A1	2	
	JYL		6950	43.17	A1	3	
	JJY2		7000	42.86	A0	5	
	JYP		7560	39.68	A1		
	JYR		7880	38.07	A1,A3	5	
	JYB		8165	36.74	A1	3	
	JJY3		9000	33.33	A0	5	

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Tokyo (Kemikawa), Chiba Pref. (Cont'd)	JYG		9440	31.78	A1	1	
	JIQ		9715	30.88	A1, A2	2	
	JYW		9735	30.82	A1	2	
	JYS		9840	30.49	A1, A3	10	
	JYJ		10480	28.63	A1	5	
	JYC		10780	27.83	A1	3	
	JYM		11680	25.68	A1	3	
	JIQ2		11970	25.06	A1, A2	2	
	JYX		12180	24.63	A1	2	
	JJY4		13000	23.08	A0	5	
	JYD		13080	22.94	A1	1	
	JYK		13610	22.04	A1	5	
	JIP2		13830	21.69	A1, A2	2	
	JYN		14440	20.78	A1	3	
	JYT		15760	19.04	A1, A3	5	
	JYE		16320	18.38	A1	1	
	——		19800	15.15	A3	5	
Tokyo (Komuro), Saitama Pref.		35°58'30"N., 139°37'30"E.					Receiving station for overseas radio telephony (controlling office at Tokyo, transmitting station at Nasaki). Equipped with 5 short-wave receivers using the superheterodyne circuit.
Tokyo (Nasaki), Ibaraki Pref.		36°10'44"N., 139°51'00"E.					Transmitting station for overseas radio telephony and overseas short-wave radio broadcasts. Controlling office and studies in Tokyo.
	JVV		5730	52.36	A3	10	
	JZN		5765	52.04	A3	10	
	JVU		5790	51.81	A3	10	For service to Manchuria.
	JZG		6330	47.39	A3	10	
	JVT		6750	44.44	A3	20	For service to U.S.A.
	JVS		6990	42.92	A3	10	For service to China.
	JVX		7345	40.84	A3	10	
	JVR		7390	40.60	A3	10	

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in maters	Type	Power in kw.	Remarks
Tokyo (Nasaki) Cont'd.	JVQ		7470	40.16	A3	20	For service to N.E.I.
	JVP		7510	39.95	A3	20	For service to Europe.
	JVX2		10190	29.44	A3	10	
	JZO		10270	29.21	A3	10	
	JVO		10375	28.92	A3	10	For service to Manchuria.
	JVN		10660	28.14	A3	20	For service to U.S.A.
	JVM		10740	27.93	A3	20	For service to Europe.
	JVL		11660	25.73	A3	10	
	JVK		12020	24.96	A3	20	For service to China.
	JLV		12145	24.70	A3	10	For service to China.
	JVJ		12275	24.44	A3	10	For service to Asia.
	JVI		13560	22.12	A3	10	For service to Manchuria.
	JVX3		14425	20.80	A3	10	
	JVH		14600	20.55	A3	20	For service to Europe.
	JVG		14910	20.12	A3	10	For service to Europe.
	JVF		15620	19.21	A3	20	For service to U.S.A.
	JVE		15660	19.16	A3	10	For service to N.E.I. and Philippines.
	JZP		15700	19.11	A3	10	
	JVD		15860	18.91	A3	20	For service to China.
	JVC		16050	18.69	A3		
	JVB		18190	16.49	A3	10	For service to N.E.I. and Philippines.
	JVB		18240	16.45	A3	10	For service to N.E.I.
	JVA		18910	15.86	A3	20	For service to Europe.
	JVY		20160	14.88	A3	20	
	JVY2		20795	14.43	A3	20	For service to S. America, Europe.
Tokyo (Oyama), Tochigi Pref.		36°16'32"N., 139°48'00"E.					Transmitting station of the Eastern Japan Radio Central for radio telegraphy (controlling office, Tokyo).
	JUB		4680	64.10	A1		

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Tokyo (Oyama) Cont'd.	JUR		4980	60.24	A1,A2	1	For service to China.
	JNR		5005	59.94	A1,A2	40	For Service to U.S.A.
	EOB		5812.5	51.61	A1	10	
	JUL		6730	44.58	A1	20	For service to Holland.
	JNU		6815	44.02	A1,A2	40	
	JJS		6915	43.38	A1,A2	1	
	JAU		7320	40.98	A1	10	
	JAU2		7327.5	40.94	A1,A2	40	
	JAE		7420	40.43	A1	10	For service to N.E.I.
	JYY		7495	40.03	A1,A2	20	For service to Colombia.
	JUI		7570	39.63	A1	1	For service to China.
	JUV		7610	39.42	A1,A2	10	For service to Moscow.
	JAH		7630	39.32	A1	10	
	EOU		7645	39.24	A3	5	For service to China.
	JNR2		7725	38.83	A1,A2	35	For service to U.S.A.
	JUT		8010	37.45	A1,A2	20	For service to Peru, Brazil.
	JNO		8110	36.99	A1	20	For service to Italy.
	JUE		8135	36.88	A1	20	For service to Argentina.
	JAX		8700	34.48	A1	10	
	JAB		9160	32.75	A1	20	For service to U.S.A.
	JNU2		9175	32.70	A1,A2	40	
	JUJ		9265	32.38	A1	1	For service to China.
	JUO2		9420	31.85	A1,A2	20	
	JUO		9430	31.81	A1,A2	20	
	JNR3		9785	30.66	A1,A2	30	For service to U.S.A.
	JAV		10225	29.34	A1	20	
	JUW		10980	27.32	A1,A2	10	For service to Moscow.
	EOU2		11485	26.12	A3	5	For service to China.
	JUU2		11940	25.13	A1,A2	30	For service to Peru, Brazil.
	JJS2		12045	24.90	A1,A2	1	
	EOB		12165	24.66	A1,A2	5	For service to China.
	JUF		12190	24.61	A1	10	
	ENO		12285	24.42	A1	10	
	JUP		13065	22.96	A1,A2	20	
	JNR4		13215	22.70	A1,A2	25	For service to U.S.A.
	JNU3		13475	22.26	A1,A2	40	
	JUM		13705	21.89	A1	20	For service to Holland.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Tokyo (Oyama) Cont'd.	JUM2		13715	21.87	A1,A2	20	
	JNP		13740	21.84	A1	20	For service to Italy.
	EOA3		14436	20.78	A1,A2	20	
	JAR		14640	20.49	A1,A2	20	For service to India.
	JAC		14700	20.41	A1	20	For service to America.
	JAY		14760	20.33	A1	20	For service. to U.S.A.
	JUQ7		15045	19.94	A1A2A4	20	
	EOU3		15090	19.88	A3	5	For service to China.
	JUU		15380	19.51	A1,A2	20	For service to Peru, Brazil
	JUR2		15425	19.45	A1A2A4	20	
	JYZ		15570	19.27	A1,A2	20	For service to Colombia.
	JUD		15880	18.89	A1	20	For service to America.
	JNR5		15945	18.81	A1A2	20	For service to U.S.A.
	JUN		16145	18.58	A1	20	For service to Holland.
	JUN2		17935	16.73	A2	20	For service to Europe.
	JUX		17950	16.71	A1,A2	10	For service to Moscow.
	JUR4		18035	16.63	A1A2A4	20	
	JUQ		18080	16.59	A1	20	
	JUR5		18130	16.55	A1A2A4	20	
	JAT		18320	16.38	A1	20	For service to U.S.A.
	EOA4		18570	16.16	A1,A2	20	
	JNR6		18575	16.15	A1,A2	20	For service to U.S.A., Peru.
	JAD		18600	16.13	A1	20	
	JNQ2		18945	15.84	A2	20	For service to Switzerland.
	JUR6		19235	14.60	A1A2A4	20	
	JAZ		20560	14.59	A1		For service to Australia.
	JJR		24050	12.47	A1,A2	20	
	JJR2		27000	11.11	A1,A2	20	
	JJR3		30010	9.997	A1,A2	20	
	JJR4		39140	7.665	A1,A2	20	
Tokyo (Tomioka), Fukushima Pref.		37°20'55"N., 141°01'42"E.					Former transmitting station for the Eastern Japa Radio Central in conjunction with Haranomachi. Now superseded by Oyama.
	JAN		6960	43.10	A1	20	For service to U.S.A.
	JAP		11980	25.04	A1	10	In addition to the frequencies listed there are 32, varying from 35 to 15600 kcs., no call letters given, in the Tokyo area, for governmental use.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw	Remarks
Tomie,	JXF	32°36'24"N	225	1333	A1	0.5	Supersedes
Fukae Jima		128°45'05"E.					The old
Nagasaki Pref.							station at
							Ose Zaki,
							Fukae Jima.
Tomioka: See							
Tokyo (Tomioka)							
Toshi,	JQC	34°31'36"N.,					
Mie Pref.		136°54'18"E.					
		(approx.)					
Toyohara,	JTY	46°58'00"N.,	3530	84.99	A1	0.0003	
Karafuto	JTY	142°44'00"E.	4270	70.29	A1	2	
	JTY		4360	68.81	A1	2	
	JTY		5990	50.08	A1	2	
	JTY		6890	43.54	A1	2	
	JTY		9060	33.11	A1	2	
	JTY		11580	25.91	A1	2	
Tsuno Shima,	JTS	34°30'30"N.,	90.5	3315	A1	1	Located near
Yamaguchi Pref.		130°50'30"E.					the light-
							house. Normal
							range 450
							nautical
							miles, max-
							imum 1,500.
Wakasa,	JWA	35°36'05"N.,	95	3158	A1	1	
Fukui Pref.		135°55'24"E.					
Wakkanai,	JGB	45°25'23"N.,	98.5	3046	A1	0.2	Range about
							230 miles.
							Ultra-short-
							wave radio
							telephony to
							Otomari reported
							available.
Yokkaichi: See							
Nagoya (Yokkaichi)							
Yokosuka,	JME	35°16'30"N.,					Naval radio
Kanagawa Pref.		139°40'00"E.					station, low-
		(approx.)					power spark,
							range 1,500
							to 2,000
							nautical miles.
Yoron Jima,	JQQ	27°02'35"N.,					
Nansei Shoto		128°25'10"E.					
		(approx.)					
Yu Shima,	JQL	32°36'N.,					
Nagasaki Pref.		130°20'E.					
		(approx.)					
Zamami Shima	KRA	26°14'00"N.,	1750	171.4		0.5	Planned
Nansei Shoto		127°18'30"E.	3250	92.31	A3		1939
		(approx.)					
Yosami: See							
Osaka (Yosami)							

Table 2. Coastal radio stations in Japan proper
(Land stations performing a service with ship stations)

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Choshi,	JCS	35°44'13"N.,	132	2273	A1	3	On Myotoga
Chiba Pref.		140°51'58"E.	143	2100	"	"	Bana, the NE
		35°45'11"N.,	418	718	A2	"	extremity of
		140°45'16"E.	500	600	"	"	the promontory.
	JCT		5250	57.16	A1	0.5	Time signals
	JCT		8200	36.59	"	10	are sent out.
	JPT		11145	26.92	"	10	
	JQE		13160	22.80	"	10	
	JCT		17360	17.28	"	0.5	
Esutoru,	JTX	49°03'59"N.,	131	2290	A1	1	
Karafuto.		142°02'47"E.	143	2100	"	"	
			383	783	A2	"	
			407	737	A2	"	
			500	600	"	"	
Hakodate,	JHK	41°46'09"N.,	140	2143	A1	1	
Oshima Prov.,		140°50'19"E.	143	2100	"	"	
Hokkaido.			433	693	A2	0.5	
			500	600	"	"	
Horomushiro,	JHJ	50 29'20"N.,	119	2520	A1	2	
Kurile Islands		156°07'30"E.	143	2100	"	"	
			450	667	A2	1	
			500	600	"	"	
	JHI		4490	66.82	A1	0.5	
			8860	33.86	"	"	
Kagoshima,	JKB	31°38'15"N.,	133	2255	A1	1	
Kagoshima Pref.		130°34'25"E.	143	2100	"	"	
			435	690	A2	"	
Kobe,	JGD	34°41'00"N.,	454	661	A2	0.1	For official
Hyogo Pref.		135°04'00"E.	500	600	"	"	messages
	JKO	34°40'16"N.,	4152.5	72.07	A3	0.5	to ships with-
	JKO	135°10'11"E.	6310	47.54	"	"	in a
	JKO		8325	36.04	"	"	20-mile
	JKO		12620	23.77	"	"	radius.
Minami Daito Jima,	JPX	25°51'00"N.,	109	2750	A1	0.5	
(Minami Oagari Jima)		131°15'00"E.	391	767	A2	0.3	
Nansei Shoto			500	600	"	"	
Moji							
	JOS		139	2158	A1	3	For shipping
			143	2100	"	"	between W.
			400	750	A2	"	Kyushu and
			500	600	"	"	Shanghai
Nagasaki (Aino),	JOR	32°48'05"N.,	5380	55.76	A1	1	
Nagasaki Pref.		130°09'25"E.	8740	34.32	A1	1	
			12700	23.62	"	"	
			17320	17.32	"	"	
Nagoya	JHY	35°05'19"N.,	454	661	A2	0.1	
Aich: Pref.		136°53'07"E.	500	600	"	0.1	

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Naha, Okinawa Jima, Nansei Shoto	JCX	26°12'10"N., 127°41'10"E.	143	2100	A1	0.5	2 steel towers
			148	2027	"	"	
			450	667	A2	"	
			500	600	"	"	
Niigata, Niigata Pref.	JK°	37°58'00"N., 139°02'00"E.	391	767	A1	0.5	
			500	600	A2	"	
Oita, Oita Pref.	JIT	33°14'05"N., 131°40'18"E.	143	2100	A1	2	
			146	2055	"	"	
			391	767	A2	"	
			500	600	"	"	
Otchishi, (Ochiishi) Nemuro Prov., Hokkaido.	JKR	43°10'00"N., 145°30'48"E.	5300	56.60	A1	1	
	JKS		8660	34.64	"	"	
	JKT		12755	23.52	"	"	
	JKU		17220	17.42	"	"	
	JOC		143	2100	"	3	
			147	2041	"	"	
			438	685	A2	"	
			500	600			
Otomari, Karafuto	JTW	46°36'40"N., 142°46'46"E.	128	2344	A1	3	
			143	2100	"	"	
			391	767	A2	"	
			500	600	"	"	
Shimotsui, Okayama Pref.	JSX	34°26'16"N., 133°48'33"E.	109	2750	A1	1	
			143	2100	"	"	
			433	693	A2	"	
			500	600	"	"	
Shiono Misaki, Wakayama Pref.	JSM	33°25'57"N., 135°45'46"E.	143	2100	A1	1	
			149	2013	"	"	
			397	755	A2	"	
			500	600	"	"	
Tsuno Shmia, Yamaguchi Pref.	JTS	34°20'35"N., 130°50'39"E.	134	2240	A1	1	
			143	2100	"	"	
			415	723	A2	"	
			500	600	"	"	
Wakasa, Fukui Pref.	JWA	35°36'05"N., 135°55'24"E.	138	2174	A1	2	
			143	2100	"	"	
			403	745	A2	"	
			500	600	"	"	
Wakkanai, Soya, Prov., Hokkaido	JGB	45°25'23"N., 141°40'32"E.	460	652	A2	0.2	
			500	600	"	"	
			600	500	A3	0.018	
Yokohama, Kanagawa Pref.	JGC	35°26'41"N., 139°38'55"E.	454	661	A2	0.2	100 mile radius.
			500	600	"	"	

Note: Normal working wave is underlined.

Otaru	JHY	43°12'N., 141°00'E. (appr.)	92.5	32.43	A1	1
			109	2752	A1	1

Table 3. Aeronautical radio stations in Japan proper
(Land stations performing a service with aircraft)

Station	Call letters	Location	For transmission: Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	For reception: Frequencies in kcs.	Wave lengths in meters	Type	Remarks
Aomori, Aomori Pref.	JXR	40°51'52"N., 140°40'17"E.	329	912	A1,A2,A3	0.5				
			5167.5	58.05	A1,A2,A3	0.5	20-1000	15000-300	A1,A2,A3	
			6593	45.50	"	"	2000-16000	150-16.67	"	
			6975	43.01	"	"	"	"	"	
			9132.5	32.85	"	"		"	"	
Chichi Jima, Ogasawara Gunto, Nampo Shoto	JRS	25°05'40"N., 142°12'00"E.	85.5	3508						For the use of aircraft on the Tokyo-Palau route.
Choshi, Chiba Pref.	JCS	35°44'13"N., 140°51'58"N.	132	2273	A1	1	15-21000	20000-14.29	A1,A2	
			143	2100	"	"	"	"	"	
			418	718	A2	"	"	"	"	
			500	600	"	"	"	"	"	
			5250	57.14	A1	0.5	"	"	"	
			8200	36.59	"	"	"	"	"	
			13160	22.80	"	"	"	"	"	
Fukuoka, Fukuoka Pref.	JXF	33°42'35"N., 130°26'36"E.	200	1500	A1	2	20-1000	15000-300	A1,A2,A3	Located at the Fukuoka Commercial Airport. Power furnished by the power plant furnishing to Fukuoka.
			220	1364	A1	0.5	"	"	"	
			328	915	A1,A2,A3	"	"	"	"	
			333	900	A2,A3	"	"	"	"	
			500	600		"				
			5460	54.95	A1	"	4000-20000	75-15	A1,A2,A3	
			6600	45.45	"	"	"	"	"	
			9380	31.98	"	"	"	"	"	

RESTRICTED

			For transmission				For reception			
Station	**Call letters**	**Location**	**Frequencies in kcs.**	**Wave lengths in meters**	**Type**	**Power in kw.**	**Frequencies in kcs.**	**Wave lengths in meters**	**Type**	**Remarks**
Hachijo Jima,	JHA	33°08'00"N.,	500	600	A1,A2	0.5	3000-21000	100-14.29	A1,A2	
Izu Shichito,	JXT	139°45'00"E.	5167.5	58.05	A1	0.25	400-23000	750-13.04	"	
Nampo Shoto			6593	45.50	"	"	"	"	"	
			9132.5	32.85	"	""	"	"	"	
Hakone,	JXH	35°10'40"N.,	200	1500	A1	0.5	20-1000	15000-300	A1,A2,A3	
Mishima,		139°00'40"E.	225	1333	"	"	"	"	"	
Kanagawa Pref.			333	900	A2,A3	"	"	"	"	
Haneda (Tokyo).	JXS	35°38'35"N.,	200	1500	A1	1	20-23000	15000-13.0	A1,A2,A3	Airport at
Kemikawa,		140°04'40"E.	210	1429	"	5	"	"	"	Haneda, Kamata
Tokyo			333	900	A2,A3	1	"	"	"	Ku, Tokyo.
	JXG		5495	54.60	A1,A2,A3	"	"	"	"	Radio facili-
			6593	45.50	"	"	"	"	"	ties of
			6975	43.01	"	"	"	"	"	Kemikawa used.
			8670	34.60	"	"	"	"	"	
			9050	33.15	"	"	"	"	"	
Izuhara,	JXI	34°12'10"N.,	200	1500	A1	0.5	20-1000	15000-300	A1,A2,A3	
Tsushima		129°17'30"E.	235	1277	"	"	"	"	"	
			333	900	A2,A3	"	"	"	"	
			500	600	"	"	"	"	"	
Kagoshima,	JKB	31°38'15"N.,	260	1154	A1	1.5	15-23000	20000-13.04	A1,A2	
Kagoshima Pref.		130°34'25"E.	333	900	A2	"	"	"	"	
			500	600	"	"	"	"	"	
Kameyama,	JXK	34°51'40"N.,	200	1500	A1	0.5	20-1000	15000-300	A1,A2,A3	
Mie Pref.		136°27'25"E.	215	1395	"	"	"	"	"	
			333	900	A2,A3	"	"	"	"	

			For transmission				For reception			
Station	**Call letters**	**Location**	**Frequencies in kcs.**	**Wave lengths in meters**	**Type**	**Power in kw.**	**Frequencies in kcs.**	**Wave lengths in meters**	**Type**	
Kanazawa,	JKV	36°34'10"N.,	5360	55.97	A1	0.25				Reported used as
Ishikawa Pref.		136°39'40"E.	7400	40.54	"	"				a beacon for
			8000	37.50	"	"				aircraft on the
										Tokyo-Hainking
										route.
Kochi,	JXN	33°29'29"N.	4535	66.15	A1,A2,A3	0.5	300-15000	1000-20	A1A2A3	
Kochi Pref.		133°33'20"E.	6593	45.50	"	"	4000-20000	75-15	"	
Shikoku			6975	43.01	"	"	"	"	"	
			9185	32.66	"	"	"	"	"	
Naha,	JCX	26°12'10"N.,	280	1071	A2	1	15-21000	20000-14.29	A1A2	
Okinawa Jima,		127°41'10"E.	333	900	"	"	"	"	"	
Nansei Shoto			500	600	"	"	"	"	"	
Otchishi (Ochiishi)	JOC	43°10'00"N.,	143	2100	A1	3	15-21000	20000-14.29	A1A2	Near the cape.
Nemuro Prov.,		145°30'48"E.	147	2041	"	"	"	"	"	The top of the
Hokkaido			438	685	A2	"	"	"	"	tower is 297 ft.
			500	600	"	"	"	"	"	above the
	JKR		5300	56.60	A1	"	"	"	"	ground and 455
	JKS		8660	34.64	"	"	"	"	"	ft. above sea
	JKT		12755	23.52	"	"	"	"	"	level.
	JKU		17220	17.42	"	"	"	"	"	
Sapporo,	JXP	43°06'06"N.,	5270	56.93	A1,A2,A3	1	20-1000	15000-300	A1A2A3	
Ishikari Prov.,		141°22'00"E.	6593	45.50	"	"	2000-18000	150-16.67	"	
Hokkaido			6975	43.01	"	"	"	"	"	
			9450	31.75	"	"	"	"	"	

Station	Call letters	Location	For transmission: Frequencies in kcs.	Wave lengths in meters	Type	Power kw.	For reception: Frequencies in kcs.	Wave lengths in meters	Type	Remarks
Sendai Miyagi Pref.	JXQ	38°16'55"N., 141°01'02"E.	5167.5	58.05	A1,A2,A3	0.5	20-1000	15000-300	A1,A2,A3	
			6593	45.50	"	"	2000-16000	150-16.67	"	
			6975	43.01	"	"	"	"	"	
			9132.5	32.85	"	"	"	"	"	
Settsu (Osaka), Osaka Pref.	JXO	34°31'45"N., 135°31'03"E.	200	1500	A1	1	20-23000	15000-13.04	A1,A2,A3	Radio station near Sakai
			240	1250	"	"	"	"	"	
			333	900	A2	"	"	"	"	
	JXC		5342.5	56.15	A1,A2,A3	"	"	"	"	
			6593	45.50	"	"	"	"	"	
			6976	43.01	"	"	"	"	"	
			8595	34.90	"	"	"	"	"	
			9105	32.95	"	"	"	"	"	
Tomie, Fukae, Jima, Nagasaki Pref.	JXY	32°36'24"N. 128°45'50"E.	200	1500	A1	0.5	20-1000	15000-300	A1,A2,A3	
			225	1333	"	"	"	"	"	
			333	900	A2,A3	"	"	"	"	
			500	600	"	"	"	"	"	
Yonago, Tottori Pref.	JXW	35°26'56"N., 133°21'04"E.	5385	55.71	A1,A2,A3	1	20-23000	15000-13.04	A1,A2,A3	
			6593	45.50	"	"	"	"	"	
			6975	43.01	"	"	"	"	"	
			9167.5	32.72	"	"	"	"	"	

Note: The normal working wave is underlined.

Table 4. Radio direction-finder stations in Japan proper (Radio aids to navigation)

Stations	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Sectors Calibration in degrees
Erimo (Yerimo), Zaki Light Station, S. Hokkaido.	JLM	41°55'30"N., 143°14'50"E.	375 500	800 600	A1,A2,B A1,A2,B	Reliable: 025-295
Esan (Yesan) Zaki Light Station, Tsugaru Straits, S. Hokkaido.	JLF	41°48'44"N., 141°11'14"E.	375 500	800 600	A1,A2 A2,B	Reliable: 334-190
Fukuyama Light Station, Tsugaru Straits, S. Hokkaido.	JLK	41°25'18"N., 140°05'30"E.	375 500	800 600	A1,A2,B A1,A2,B	Reliable: 110-280
Inubos Zaki, Chiba Pref., E. Honshu.	JLH	35°42'18"N., 140°52'21"E.	365 500	822 600	A1,A2 A1,A2	
Iro Zaki Light Station, Shizuoka Pref., S. Honshu.	JLJ	34°36'05"N., 138°50'50"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 139-205 Uncertain: 061-138; 206-231.
Kinkazan, Miyagi Pref., E. Honshu.	JLC	38°16'25"N., 141°35'16"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 025-190
Nishi Notoro Misaki Light Station, S. Karafuto.	JTV	45°53'32"N., 142°05'03"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 030-310
Nojima Zaki Light Station, Chiba Pref. S. Honshu.	JLA	34°53'54"N., 139°53'30"E.	375 500	800 600	A1,A2 A2	Reliable: 085-265
Oma Zaki Light Station, Aomori Pref., N. Honshu.	JLG	41°33'12"N., 140°54'48"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 210-106
Ominato, Aomori Pref., N. Honshu.		41°16'N., 141°09'E. (approx.)	The Navy maintains a high-frequency radio direction-finder station at Ominato.			

Stations	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Sectors Calibration in degrees
O Shima Light Station, Izu Shichito, Nampo Shoto.	JLI	34°47'45"N., 139°22'30"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 210-259; 291-039; 081-110. Uncertain: 260-290; 040-080.
Shiriya Zaki Light Station, Aomori Pref., N. Honshu.	JLD	41°25'38"N., 141°27'58"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 286-166
Soya Misaki Light Station, N. Hokkaido.	JLN	45°31'10"N., 141°56'24"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 299-073 Unreliable: 266-298; 073-120.
Tappi Zaki Light Station, Aomori Pref., N. Honshu.	JLL	41°15'24"N., 140°20'46"E.	375 500	800 600	A1,A2,B A2,B	
Todo Zaki Light Station, Iwate Pref., E. Honshu.	JLE	39°32'40"N., 142°04'30"E.	375 500	800 600	A1,A2,B A2,B	Reliable: 358-186
Yerimo Zaki: See Erimo Zaki.						
Yesan Zaki: See Esan Zaki						

Table 5. Radio beacons in Japan proper
(Radio aids to navigation)

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Remarks
Aomori Ko, Aomori Pref., N. Honshu.	JHM	40°49'32"N., 140°45'09"E.	310 410	968 732	A2 A2	
	JHM2	40°50'33"N., 140°43'00"E.	285 410	1053 732	A2 A2	
Choshi, Chiba Pref. E. Honshu.	JCS	35°44'13"N., 140°51'58"E.	418	718	A2	Coastal station serving as a radio beacon on request. Power:3 kw.
Erimo (Yerimo) Zaki Light Station, S. Hokkaido.	JLM	41°55'30"N., 143°14'50"E.	310 500 375	968 600 800	A1,A2 A2,B A2,B	
Esan (Yesan) Zaki Light Station, S. Hokkaido.	JLF	41°48'44"N., 141°11'14"E.	290 500	1034 600	A1,A2 A2,B	
Fukuyama Light Station, S. Hokkaido.	JLK	41°25'18"N., 140°05'20"E.	300 500	1000 600	A1,A2 A2,B	Power 0.35 kw.
Hakodate, S. Hokkaido.	JHK	41°46'09"N., 140°50'19"E.	433	693	A2	Coastal station serving as a radio beacon on request. Power 0.5 kw.
Hakodate (Kattoshi), S. Hokkaido.	JGN	41°44'38"N., 140°35'54"E.	310	968	A2	
Hakodate (Kunebetsu), S. Hokkaido.	JGO	41°49'36"N., 140°40'35"E.	285	1053	A2	
Horomushiro (Tomari Zaki), Kurile Is.	JHJ	50°29'15"N., 156°07'48"E.	450	667	A2	Coastal station serving as a radio beacon on request. Power 1 kw.
Inuboe Zaki Light Station, Chiba Pref., E. Honshu.	JLH	35°42'17"N., 140°52'19"E.	300 375 500	1000 800 600	A1,A2 A2,B A2,B	
Iro Zaki Light Station, Shizuoka Pref., S. Honshu.	JIJ	34°35'58"N., 138°50'53"E.	300 500	1000 600	A1,A2 A2,B	

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Remarks
Kinkasan Light Station, Miyagi Pref., E. Honshu.	JLC	38°16'25"N., 141°35'16"E.	300 500	1000 600	A2 A2,B	
Kunebetsu: See Hakodate (Kunebetsu)						
Kusakaki Shima Light Station, Kagoshima Pref., SW. Kyushu.		30°51'N., 129°28'E. (approx.)	300	1000	A1,A2	Experimental station.
Me Shima, Kagoshima Pref., W. Kyushu.	JGI	31°59'35"N., 128°21'20"E.	300	1000	A1,A2	Experimental station. Power 0.25 kw.
Nishi Notoro Misaki Light Station, S. Karafuto.	JTV	45°53'32"N., 142°05'02"E.	300 375 500	1000 800 600	A1,A2 A2,B A2,B	Power 0.35 kw.
Nojima Zaki Light Station, Chiba Pref., S. Honshu.	JLA	34°53'54"N. 139°53'30"E.	300 500	1000 600	A2 A2,B	
Oita, Oita Pref., E. Kyushu.	JIT	33°14'05"N., 131°40'18"E.	391	767	A2	Coastal station serving as a radio beacon on request. Power 2 kw.
Oma Zaki Light Station, Aomori Pref., N. Honshu.	JLG	41°33'10"N., 140°54'50"E.	305 500	984 600	A1,A2 A2,B	
Onishibetsu, N. Hokkaido.	JGQ	45°19'35"N., 142°07'06"E.	310	968	A1	
O Shima Light Station, Izu Shichito, Nampo Shoto.	JLI	34°47'45"N., 139°22'43"E.	300 375 500	1000 800 600	A1,A2 A2,B A2,B	Power 0.35 kw.
Otchishi (Ochiishi), E. Hokkaido.	JOC	43°10'00"N., 145°30'48"E.	438	685	A2	Coastal station serving as a radio beacon on request. Power 3 kw.
Otomari, Karafuto	JTW	46°36'40"N., 142°46'46"E.	391 500	767.3 600	A2 A2,B	Coastal station serving as aradio beacon on request. Power 3 kw.
Shimotsui, Okayama Pref., S. Honshu.	JSX	34°26'16"N., 133°48'33"E.	433	693	A2	Coastal station serving as a radio beacon on request. Power 1 kw.

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Remarks
Shiono Misaki, Wakayama Pref., S. Honshu	JSM	33°25'57"N., 135°45'46"E.	397	755	A2	Coastal station serving as a radio beacon on request. Power 1 kw.
Shioya Zaki Light Station, Fukushima Pref., E. Honshu	JLB	36°59'30"N., 140°59'00"E.	300 375 500	1000 800 600	A1.A2 A2.B A2.B	
Shiriya Zaki Light Station, Aomori Pref., N. Honshu	JLD	41°25'44"N., 141°27'58"E.	295 500	1017 600	A1.A2 A2.B	
Soya Misaki Light Station, N. Hokkaido	JLN	45°31'10"N., 141°56'24"E.	300 375 500	1000 800 600	A1.A2 A2.B A2.B	Power 0.35 kw.
Tappi Zaki Light Station, Aomori Pref., N. Honshu.	JLL	41°15'23"N., 140°20'46"E.	315 500	952 600	A1.A2 A2.B	Power 0.35 kw.
Todo Zaki Light Station, Iwate Pref., E. Honshu.	JLE	39°32'40"N., 142°04'30"E.	305 500	984 600	A1.A2 A2.B	
Tomari Zaki: See Horomushiro						
Tsuno Shima, Yamaguchi Pref., W. Honshu.	JTS	34°20'35"N., 130°50'39"E.	415	723	A2	Coastal station serving as a radio beacon on request. Power 1 kw.
Wakasa, Fukui Pref., NW. Honshu	JWA	35°36'05"N., 135°55'24"E.	403	745	A2	Coastal station serving as a radio beacon on request. Power 3 kw.
Wakkanai, N. Hokkaido	JGP	45°25'23"N., 141°40'32"E.	285	1053	A2	Power o.2 kw.
Yarimo Zaki: See Erimo Zaki						
Yesan Zaki: See Esan Zaki						
Yokohama, Kanagawa Pref., SE. Honshu	JGC	35°26'41"N., 139°38'55"E.	460	652.2	A2	Coastal station serving as a radio beacon on request. Power 0.35.

Note: The normal working wave is underlined.

Table 6. Stations broadcasting weather information in Japan proper (Radio weather aids to navigation)

Station	Call letters	Location	Frequencies in kcs.	Wave lengths in meters	Type	Power in kw.	Remarks
Choshi, Chiba Pref.	JCS	35°44'13"N., 140°51'58"E.	500	600	A2.B	3	
Kobe, Hyogo Pref.	JTJ	34°41'17"N., 135°10'48"E.	75 500	4000 600	A1 B	3 0.25	Marine Observatory.
Nagasaki (Aino), Nagasaki Pref.	JOS	32°48'05"N., 130°09'25"E.	500	600	A2.B	3	
Naha, Okinawa Jima, Nansei Shoto	JGH	26°12'10"N., 127°41'10"E.	75 500	4000 600	A1 B	0.5 0.5	Meteorological Observatory.
Otchishi, E. Hokkaido	JOC	43°10'00"N. 145°30'48"E.	500	600	B	3	
Otomari, Karafuto	JTW	46°36'40"N., 142°46'46"E.	72 500	4170 600	A1 A2	3 3	
Shimotsui, Okayama Pref.	JSX	34°26'16"N., 133°48'33"E.	500	600	B	1	
Shiono Misaki, Wakayama Pref.	JSM	33°25'57"N., 135°45'46"E.	500	600	B	1	
Tokyo (Shiba Park), Tokyo Pref.	JGA	35°39'35"N., 139°44'40"E.	75 500	4000 600	A1 A2	2.5	Central Meteorological Observatory.
Tsuno Shima, Yamaguchi Pref.	JTS	34°20'35"N., 130°50'39"E.	500	600	B	1	

Table 7. Meteorological observation stations in Japan proper (Radio weather aids to navigation)

Station	Code letters	Location	Remarks
Abashiri, Hokkaido		44°01'N., 144°17'E.	
Aikawa, Sado Shima, Niigata Pref.		38°02'N., 138°14'E.	
Akita, Akita Pref.	AK	39°43'N., 140°06'E.	
Aomori, Aomori Pref.		40°49'N., 140°47'E.	
Ashizuri: See Shimizu			
Chichi Jima, Ogasawara Nampo Shoto	Bo, TT	27°05'N., 142°11'E.,	
Choshi, Chiba Pref.	Ts	35°44'N., 140°52'E.	
Fukui, Fukui Pref.	Hu	36°03'N., 136°16'E.	
Haboro, Hokkaido		44°23'N., 141°42'E.	
Hachijo Izu Shichito, Nampo Shoto	Ha	33°06'N., 139°50'E.	
Hakodate, Hokkaido	Hd	41°46'N., 140°43'E.	
Hamada, Shimane Pref.		34°54'N., 132°04'E.	
Hamamatsu, Shizuoka Pref.	Hm	34°43'N., 137°43'E.	
Horomushiro, Kurile Is.		50°29'N., 156°08'E.	
Ishigaki Jima, JGL Nansei Shoto	Is	24°20'N., 124°10'E.	
Ishinomaki, Miyagi Pref.	Im	38°26'N., 141°19'E.	
Iwo Jima, Kazan Retto, Nampo Shoto		23°48'N., 141°18'E.	
Izuhara, Tsushima	Iz	34°12'N., 129°18'E.	
Kagoshima, Kagoshima Pref.	Ka	31°35'N., 130°33'E.	

Station	Code letters	Location	Remarks
Kobe, Hyogo Pref.	Kb	34°41'N., 135°11'E.	
Kochi, Kochi Pref.	Ki	33°33'N., 133°32'E	
Maoka, Karafuto		47°03'N., 142°03'E.	
Matsue: See Sakai			
Matsuyama, Ehime Pref.		33°50'N., 132°45'E.	
Mera: See To Misaki	Me		
Minami Daito Jima (Minami Oagari Jama), Nansei Shoto	Oa	25°50'N., 131°13'E.	
Miyako, Iwate Pref.	Mi	39°38'N., 141°58'E.	
Miyako Jima, Nansei Shoto	Mi	24°48'N., 125°18'E.	
Miyazaki, Miyazaki Pref.	Mz	31°55'N., 131°26'E.	
Miyazu, Kyoto Pref.		35°32'N., 135°12'E.	
Muroto Misaki, Kochi Pref.	Mu	33°15'N., 134°11'E.	
Nagasaki, Nagasaki Pref.	Ng	32°43'45"N., 129°51'50"E.	
Nagatsuro, Shizuoka Pref.		34°36'N., 138°51'E.	
Naha, Okinawa Jima, Nansei Shoto	Na Naha	26°12'13"N., 127°39'48"E.	
Naze (O Shima), Amami O Shima, Nansei Shoto	Na Os	28°23'N., 129°30'E.	
Nemuro, Hokkaido	Ne	43°20'N., 145°35'E.	
Niigata, Niigata Pref.	Ni	37°56'N., 139°03'E.	
Okino Daito Jima, (Rasa Island), Nansei Shoto		24°28'N., 131°11'E.	
Onahama, Fukushima Pref.		36°56'N., 140°54'E.	
Ose Zaki: See Tomie			

Station	Code letters	Location	Remarks
Otomari, Karafuto	Ot	46°39'N., 142°46'E.	
Rasa: See Okino Daito Jima			
Sakai, Shimane Pref.	Sk	35°33'N., 133°14'E.	
Sapporo, Hokkaido	Sp	43°04'N., 141°21'E.	
Sendai, Miyagi Pref.		38°16'N., 140°54'E.	
Shana, Etorofu Jima, Kurile Is.	Sa	45°13'N., 147°53'E.	
Shikka, Karafuto		49°14'N., 143°07'E.	
Shimizu, Kochi Pref.	Sd	32°47'00"N., 132°57'30"E.	
Shimonoseki, Yamaguchi Pref.		33°57'09"N., 130°56'27"E.	
Shiono Misaki, Wakayama Pref.		33°26'N., 135°46'E.	
Tokyo, Tokyo Pref.		35°39'N., 139°45'E.	
Tomie, Fukae Jima, Nagasaki Pref.	Tm	32°37'N., 128°46'E.	
To Misaki (Mera), Chiba Pref.	Me	34°55'N., 139°50'E.	
Urakawa, Hokkaido	Ur	42°10'N., 142°47'E.	
Wajima, Ishikawa Pref.	Wa	37°24'N., 136°54'E.	
Yaku Shima, Nansei Shoto		30°25'N., 130°34'E.	

Appendix II

DETAILS OF RADIO EQUIPMENT AND STATIONS

1. General.-- Some details of the Oyama, Fukuoka, Yosami, and Yokkaichi radio stations follow. These stations are used for overseas radio telegraph communications by the International Telecommunications Company. No details of the new Semayama and Ono stations, near Osaka, also part of the overseas radio communications system, are available.

Most of the original equipment of these stations was imported from the United States and Germany and follows R.C.A. or Telefunken lines. However, many of the subsequent installations were developed in the laboratories of the International Telecommunications Company and of the Ministry of Communications. Now all equipment is manufactured in Japan. Ninety-five percent of the equipment comes from the Nippon Electric Company, the Oki Electric Company, and the Tokyo Electric Radio Company, all in or very near Tokyo. The last company makes all the tubes used.

2. Main equipment.--a. Short-wave transmitters.-- Short-wave transmitters are, for the sake of convenience, divided into the following three classes according to their last amplification stage output:

	Approximate power in kilowatts
Type A	20 - 40
Type B	10 - 20
Type D	1

Type C is reserved for transmitters of 5-kilowatt output, which have not been adopted by the International Telecommunications Company.

As the wave-generating units of type A and type B transmitters are exactly the same in construction as the type D transmitter, the latter will be explained first. The units of a type D transmitter and the tubes used in each unit are as follows:

Crystal oscillator (2 units)	1 Cymotron UY-247	(pentode)
Buffer amplifier	1 Cymotron UX-860	(tetrode)
First stage amplifier	1 Cymotron UX-860	(tetrode
Second stage amplifier	1 Cymotron UV-861	(tetrode)
Last stage amplifier	1 Cymotron UV-861	(tetrode)
Rectifier for crystal oscillator	1 Cymotron KX-280	(kenotron)
Rectifier for bias	2 Cymotron HV-972	(hot cathode mercury rectifier)
Rectifier for anode	6 Cymotron HV-972	(hot cathode mercury rectifier)
Keying device	2 Cymotron UV-211	(triode)

In this transmitter, two complete crystal oscillator units are installed in order to avoid a change in circuit condition which would cause a change in the frequencies of the oscillators, as might be the case if the wave frequency is changed by merely switching over the crystals in a single oscillator. Constant temperature baths may be dispensed with in the crystal oscillator owing to the small temperature coefficient of frequency, which is only one millionth per degree centigrade, and, moreover, the oscillations produced are strong and stable. Since the crystal oscillators were introduced into the transmitters in 1934, the frequency stability of transmitting waves has been improved considerably.

The frequency may be changed simply by turning some switches and by adjusting the tuning condensers to the indicated settings, the time required being less than one minute.

The key device is such that the anode voltage of the first stage amplifier is varied by keying valves. A speed of transmitting as high as 400 words per minute is attainable by using a suitable relay.

Measures have been taken to prevent key-clicks which sometimes broaden the frequency bands of transmission. The method has been chosen of rounding the wave-form of signals without reducing their transmission speed.

Frequency diversity effect has been given to the transmitters by amplitude modulation when waves of this type are required by a corresponding station. To make a transmitter work efficiently as a C-class amplifier is inconsistent with the obtaining of pure modulation waves. For this reason a special frequency modulation method was adopted by which the frequency bands of transmission waves can be made much narrower.

Type A and type B transmitters use a type D transmitter as their wave generating unit, with the following type of tubes in the power amplifier unit:

	Type A	Type B
Amplifier	2 Cymotron SN-167	2 Cymotron SV-207
Rectifier for bias	2 Cymotron HV-972	2 Cymotron HX-966
Rectifier for anode	6 Cymotron HV-951	6 Cymotron HV-969

The power amplifier tubes SN-167 and SV-207 are of water-cooled type. Hot cathode mercury rectifier tubes are used for the high potential direct current supply. Quick changes for three different wave lengths can easily be accomplished in the amplifier unit.

b. Short-wave receivers.-- Short-wave receivers are classified into the following three types according to their construction:

Type A: a single-type receiver which is used for "frequency diversity"* reception.

Type B: a double-type receiver which is used for "space diversity"** reception with two antennas.

Type C: a triple-type receiver which is used for "space diversity" reception with three antennas.

* By "frequency diversity" is meant the reception of frequencies adjacent in the spectrum.

** By "space diversity" is meant the reception on two or more antennas separated in distance.

Most of the receivers are type A and type B. Type C receivers are gradually being abandoned. Type A and type B receivers will, therefore, be explained in more detail.

The total gain of this receiver (type A or type B) is about 140 decibels at the input terminals of the signal rectifier and nearly 160 decibels at the output terminals of the audio-frequency amplifier, the gain of each unit being as follows:

	Gain in decibels
Radio frequency amplifier	30 (at minimum)
First converter	30
Second converter	25
Second intermediate frequency amplifier	55
Audio-frequency amplifier	20

The selectivity of the receiver is such that the attenuation for image frequency is about 60 decibels at 20 megacycles and for near-by frequency about 20 decibels with a side band of three kilocycles and about 80 decibels with a side band of five kilocycles.

The frequency of this receiver is well stabilized by inserting ballast tubes in the filament supply leads and voltage stabilizers in the plate supply leads of the first heterodyne oscillators, and also by making the oscillators independent of thermal changes and of mechanical vibrations.

The output level of the receiver can be kept within a variation of 8 percent at 0.5 volts of filament and 7 volts of plate supply potential.

The working range of the limiter is made sufficiently broad by using a special circuit with neon tubes and tetrodes, and the D. C. output may thus easily be kept constant even in the case of signals received at a speed of 200 words per minute and fluctuating in intensity in a range of 60 decibels.

The power source of the receiver is required to deliver approximately 13.5 amperes at 10 volts for filaments and 200 milliamperes at 200 volts for plates. An automatic voltage regulator is equipped for the floating filament battery. The principle is that the terminal voltage of the battery is kept constant by controlling the exciting current of the charging generator with a grid-controlled ionization tube.

c. Short-wave antennas.— Short-wave beam antennas can be classified into the following types, each of which has its advantages in construction as well as in operation:

Type HN (Utility Model, Patent No. 198079)
Type VN (Patent No. 93663)
Type HK (Patent No. 67913)
Type VK (Patent No. 67913)
Type HT (Utility Model, Patent No. 187550)
Type VH (Patent No. 83199)
Type VM (Patent No. 85245)
Type N
Type VF (Patent No. 96405)

Type 1 to 8 are the so-called tuned antennas, elements of which are excited mainly by standing waves and tuned to specified frequencies. These types are useful for communication circuits which need high-grain antennas.

Type 9 is an aperiodic antenna in which travelling waves on the antenna wires are utilized and, accordingly, it is useful in cases where a broad band of frequencies is required. This type of antenna has been tested and developed with good results. One antenna of this type has been used in the Fukuoka receiving station and further application is expected.

Two sets of receiving antennas are now used for circuits where "space diversity" reception is necessary. Three sets were formerly used but two sets were found sufficient due to the improved design of the receiving sets.

Antenna feeders are all of the "over-head" type. Two copper wires suspended in parallel are used for transmitting antennas, and concentric copper pipes for receiving antennas in order to reduce the pick-up of local disturbances and interference of the tter to a minimum.

By a common feeder system (Patent No. 104460), two adjacent antennas can be simultaneously fed with a single feeder. This system is now used for some antennas with good results and is expected to be used more extensively.

3. Transmitting and receiving stations.—a. Oyama transmitting station. The Oyama station is located approximately 44 miles north of Tokyo and is about 2 miles from the Oyama railway station. It was built in 1930 as a short-wave transmitting center corresponding to the Fukuoka receiving station. The area occupied by the station buildings and antenna group is approximately 494 acres (200 hectares).

Thirty beam antennas and four dipoles have been erected. The main building is of two stories. In the transmitter room (illustration 16), there are installed ten type A, five type B, and two type D short-wave transmitters. The main rectifiers for the type A and type B transmitters are placed on the ground floor. (The Oyama station has since been extended.)

In order to be able to connect any transmitter to any antenna, aerial bus-bars, which are suspended on wooden poles, are set up around the main building.

Fifty-cycle, three-phase A. C., 1,000 kilowatts at maximum, is supplied by 3,300-volt power lines which were specially built for the station by the Tokyo Electric Lighting Company. In order to prevent interruptions due to power failures, the lines are duplicated and connected to a reliable network of transmission lines, coming from several independent power plants. Incoming 3,300-volt

A. C. is stepped down to 220 volts from which all of the electrical equipment in the station is fed, except lighting.

A monitoring board is installed in the middle of the transmitter room to observe the operating conditions of all of the transmitters and the line currents. The connection of transmitters with land lines and the correspondence with the Tokyo Central Telegraph Office are also handled on this board.

The transmitters are controlled directly from the Tokyo Central Telegraph Office by means of D. C. signalling on the land lines, which are about 50 miles long. However, the adoption of a multiplex voice-frequency telegraph system has been under consideration, and may have been installed.

All the appliances necessary for various investigations and tests are also installed, such as valve testers, oscillographs, recorders, and other measuring instruments.

b. Fukuoka receiving station.— The station is situated about 17 miles northwest of Tokyo and within easy reach by suburban electric cars. The station was originally established in 1927 for long-wave transmission, but it is now exclusively used for short waves. The land area covered by the extensive group of short-wave antennas is about 272 acres (110 hectares).

At present 33 beam antennas and 3 dipoles have been erected. The common feeder system referred to above is employed in some of the antennas in the station.

In the receiving room 9 type A, 11 type B, and 4 type C short-wave receivers are working at present.

The battery room consists of: (a) Three sets of 1750 ampere-hour, 10-volt storage batteries for filaments; (b) two sets of 110 ampere-hour, 200-volt storage batteries for plates; and (c) one set of 420 ampere-hour, 110-volt storage batteries for emergency lighting, etc. The charging sets for these storage batteries and an automatic voltage regulator for filament batteries while being floated are also installed in the motor-generator room. Three-phase A. C. of 3,300 volts, 50 cycles, is supplied by the aerial network of the Tokyo Electric Lighting Company, though underground cable is used on the premises of the station.

The signals received by a set of antennas and receivers are sent to the Tokyo Central Telegraph Office through the land lines by means of D. C. signals and tone of tone keyer, or the output of the heterodyne detector. The land line between Tokyo and Fukuoka is about 33 miles in length.

For flexibility in connecting any receiver to any antenna (one antenna may be connected to two or three receivers if need be), two sets of antenna switching centrals have been installed, in which concentric pipes are arranged crosswise and the connections of antenna and receiver are made by means of short connectors.

In order that the output of any receiver may be connected to any pair of land lines, and that the power level of signals which are sent to the Tokyo Central Telegraph Office may be conveniently checked, a jackboard has been installed.

A control desk has been furnished for the observation of received signals and for correspondence with the Tokyo Central Telegraph Office. Recorders have also been provided for monitoring the signals received.

In addition, the station is fully equipped with necessary appliances for accurate measurements, such as wave frequency measuring apparatus, field strength measuring sets, etc.

c. Yosami transmitting station.— The Yosami station is located about 17 miles southeast of Nagoya and 2.5 miles from the Kariya railway station. At first the station was intended only for long-wave communications, but, in the course of its construction, short-wave communications were developed so quickly that, before the completion of the station in 1929, short-wave transmitters were installed and successfully operated at this station. The land area covered by both long and short-wave antennas is about 356 acres (144 hectares).

The long-wave antenna of inverted L type is suspended by eight 250-meter (825-foot) guyed insulated steel towers and a multiple ground is employed. The antenna constants are as follows:

Effective height	183 meters (600 feet)
Total effective resistance	1.18 ohms
Antenna capacity	48,500 centimeters (53,900 micro-micro-farads)
Natural wave length	9700 meters
Working frequency	17.44 kilocycles (call letters JAD)

The long-wave transmitter comprises two 700-KVA Telefunken high-frequency alternators of the inductor type, which are employed alternately.

For short waves 13 beam antennas have been erected. Three antennas (for call letters JNJ, JNH, and JNM) are suspended between towers which suspend the long-wave antenna and special devices are used to eliminate the voltage induced from the long-wave antenna. Five type A transmitters are installed in this station at present.

The transmitters are all controlled from the Osaka Central Telegraph Office and the Nagoya Central Post Office by means of D. C. signalling in land lines. As in the case of the Oyama transmitting station, all necessary apparatus for various tests are also installed.

d. Yokkaichi receiving station.— The Yokkaichi station is situated about 17 miles southwest of Nagoya and some 2.5 miles from the Yokkaichi railway station. It was built in 1928 as a long-wave receiving station to work in conjunction with the Yosami transmitting station. At present it is chiefly used for short-wave reception. About 49 acres (20 hectares) of land are used for the buildings and short-wave antennas.

Ten beam antennas are in use for short waves and one set of double goniometer type long-wave antennas, manufactured by the Telefunken Company, has been erected.

In the short-wave receiving rooms, eight type A, one type B, and one type C receivers are used. In the long-wave receiving room four receivers, manufactured by the Telefunken Company, are working at present.

The long-wave receivers consist of double goniometer coupling units, five stage radio-frequency amplifiers and two stage audio-frequency amplifiers.

The battery room consists of: (a) 1,000 ampere-hour, 10-volt and 2,470 ampere-hour, 10-volt storage batteries for filaments; (b) two sets of 50 ampere-hour, 200-volt storage batteries for plates; and (c) one set of 290 ampere-hour, 110-volt storage batteries for emergency lighting, etc. The charging equipment is installed in a manner similar to the Fukuoka receiving station. Three-phase A. C. of 3,300 volts, 60 cycles, is supplied by the Mie Godo Electric Company.

The received signals are sent to the Osaka Central Telegraph Office and the Nagoya Central Post Office in the same manner as signals are sent through the land lines from the Fukuoka receiving station to the Tokyo Central Telegraph Office.

The station is equipped with one antenna switchboard, one jackboard, three tables with monitor recorders, and one wave-frequency measuring apparatus.

Appendix III

LONG WAVE RADIO BROADCASTING STATIONS IN JAPAN PROPER

Station	Call letters	Frequency in kcs.	Wave length in meters	Location	Power in kw.	Year of opening. remarks
Akita, Akita Pref., N. Honshu	JOUK	650	461.5	39°42'30"N., 140°07'22"E.	0.3	1932
Aomori, Aomori Pref., N. Honshu	JOTG	1050	285.7	40°50'13"N., 140°43'21"E.	0.1	1940
Asahigawa, Kamikawa Prov., Hokkaido	JOCG	700	428.6	43°45'44"N., 142°23'05"E.	0.3	1933
Bofu, Yamaguchi Pref., W. Honshu	JOUG	860	348.8	34°03'N., 131°35'E. (approx.)	0.5	1940
Fukui, Fukui Pref., Honshu	JOFG	1020	294.1	36°03'50"N., 136°13'33"E.	0.3	1933
Fukuoka Fukuoka Pref., Kyushu	JOLK	910	329.7	33°35'10"N., 130°24'00"E.	0.5	1930
Fukushima, Fukushima Pref., Honshu	JOFP	830	365.9	37°45'N., 140°28'E. (approx.)	0.1	1940
Hakodate, Oshima Prov., Hokkaido	JOVK	680	441.2	41°45'46"N., 140°42'45"E.	0.5	1932
Hamamatsu, Shizuoka Pref., Honshu	JODG	1100	272.7	34°42'43"N., 137°46'14"E.	0.5	1933
Hirosaki, Aomori Pref., N. Honshu	JORG	840	357.1	40°36'38"N., 140°28'20"E.	0.3	1938
Hiroshima, Hiroshima Pref., Honshu	JOFK	830	361.4	34°26'00"N., 132°28'20"E.	10	1928
Kagoshima, Kagoshima Pref., S. Kyushu	JOHG	1050	285.7	31°34'11"N., 130°33'51"E.	0.5	1935
Kanazawa, Ishikawa Pref., Honshu	JOJK	610	491.8	36°31'51"N., 136°36'33.7"E.	3	1930
Kochi, Kochi Pref., Shikoku	JORK	720	416.7	33°33'59"N., 133°32'16"E.	0.5	1932

Station	Call letters	Frequency in kcs.	Wave length in meters	Location	Power in kw.	Year of opening. remarks
Kofu Yamanashi Pref., Honshu	JOKG	800	375	35°39'43"N., 138°33'42"E.	0.5	1937
Kokura, Fukuoka Pref., Kyushu	JOSK	740	405.4	33°52'59"N., 130°51'41"E.	1	1931
Koriyama, Fukushima Pref., Honshu	JOCP	570	526.3	37°28'N., 140°23'E. (approx.)	0.3	1940
Kumamoto, Kumamoto Pref., Kyushu	JOGK	790	379.7	32°50'12"N., 130°43'46"E.	10	1928
Kushiro, Kushiro Prov., Hokkaido	JOPG	1010	297.0	42°58'36"N., 144°23'35"E.	0.1	1938
Kyoto, Kyoto Pref., Honshu	JOOK	1070	280.4	35°00'50"N., 135°44'57"E.	0.3	1932
Matsumoto, Nagano Pref., Honshu	JOSG	960	312.5	36°12'46"N., 137°57'03"E.	0.5	1938
Matsuyama, Ehime Pref., Shikoku	JOVG	950	315.8	33°50'N., 132°46'E. (approx.)	0.3	1940
Matsue, Shimane Pref., Honshu	JOTK	670	447.8	35°27'06"N., 133°03'33"E.	0.5	1932
Miyazaki, Miyazaki Pref., Kyushu	JOMG	600	500	31°54'34"N., 131°24'53"E.	0.5	1937
Morioka, Iwate Pref., N. Honshu	JOQG	880	340.9	39°43'05"N., 141°08'34"E.	0.5	1938
Nagano, Nagano Pref., Honshu	JONK	1040	288.5	36°39'32"N., 138°11'43"E.	0.5	1931
Nagasaki, Nagasaki Pref., Kyushu	JOAG	930	322.6	32°45'00"N., 129°53'00"E.	0.5	1933
Nagoya, Aichi Pref., Honshu	JOCK	730 990	411.0 303.0	35°03'04"N., 136°58'02"E.	10 10	No. 1: 1925 No. 2: 1933
Naha, Okinawa Pref., Nansei Shoto	JOAP	1000	300	26°12'00"N., 127°39'12"E.	1	1942

Station	Call letters	Frequency in kcs.	Wave length in meters	Location	Power in kw.	Year of opening, remarks
Niigata, Niigata Pref., Honshu	JOQK	920	326.1	37°55'12"N., 139°02'19"E.	0.5	1931
Obihiro, Tokachi Prov., Hokkaido	JOOG	950	315.8	42°55'17"N., 143°12'05"E.	0.5	1936
Oita, Oita Pref., Kyushu	JOIP	700	428.6	33°14'10"N., 131°40'30"E.	0.5	1940
Okayama, Okayama Pref., Honshu	JOKK	630	476.2	34°38'46"N., 133°56'26"E.	0.5	1931
Onomichi, Hiroshima Pref., Honshu	JODP	860	394.7	34°24'N., 133°12'E	0.5	1940
Osaka, Osaka Pref., Honshu	JOBK	690 940	434.8 319.1	34°46'21"N., 135°31'58"E.	10 10	No. 1: 1925 No. 2: 1933; power reportedly increased from 10 to 100 kw.; no verification; large new broadcasting house completed in 1936.
Sapporo, Ishikari Prov., Hokkaido	JOIK	810	370.4	43°01'21"N., 141°23'40"E.	10	1928
Sendai, Miyagi Pref., N. Honshu	JOHK	770	389.6	38°16'13"N., 140°54'47"E.	10	1928
Shizuoka, Shizuoka Pref., Honshu	JOPK	780	384.6	34°58'52"N., 138°24'48"E.	0.5	1931
Tokyo, Tokyo Pref., Honshu	JOAK	590	508.5	35°39'39"N., 139°45'06"E.	0.5	0.5 kw. station at Atagoyama in reserve. 1925
		590	508.5	35°49'20"N., 139°45'15"E.	150	No. 1: 1931
		870	344.8	35°49'20"N., 139°45'19"E.	150	No. 2: 1931; power of No. 1 and No. 2 increased from 10 to 150 kw. in 1937. New broadcasting house located near Hibiya Park, completed in 1939.
Tokushima, Tokushima Pref., Shikoku	JOXK	980	306.1	34°04'30"N., 134°33'20"E.	0.5	1933

RESTRICTED

Station	Call letters	Frequency in kcs.	Wave length in meters	Location	Power in kw.	Year of opening, remarks
Tottori, Tottori Pref., Honshu	JOLG	890	337.1	35°29'40"N., 134°14'08"E.	0.5	1935
Toyama, Toyama Pref., Honshu	JOIG	1060	283.0	36°41'36"N., 137°02'54"E.	0.5	1935
Toyohara, Karafuto	--	620	483.9	46°58'N., 142°44'E. (approx.)	1	Dec. 1939
Yamagata Yamagata Pref., Honshu	JOJG	1080	277.8	38°14'59"N., 140°21'19"E.	0.5	1936

RESTRICTED

Appendix IV

SUBMARINE CABLES IN JAPAN PROPER

(from north to south and east to west)

1. Karafuto, Hokkaido, Kurile Islands.

From	Location of landing	To	Location of landing	No. of cables
Maoka, Karafuto	47°03'00"N., 142°03'00"E.	Kaiba To, Karafuto	46°16'45"N., 141°14'45"E.	1
Kaiba To, Karafuto	46°16'45"N., 141°14'45"E.	Wakkansi (Sakanoshito), Hokkaido	45°22'27"N., 141°40'15"E.	1
Otemari (Merei), Karafuto	46°37'45"N., 142°54'00"E.	Nishi Notoro Misaki, Karafuto	45°54'30"N., 142°05'25"E.	1
Nishi Notoro Misaki, Karafuto	45°54'30"N., 142°05'25"E.	Sarufutsu, Hokkaido	45°16'00"N., 142°14'30"E.	2
Onetomanai, Hokkaido	45°11'35"N., 141°34'00"E.	Rishiri To, Hokkaido	45°09'20"N., 141°19'30"E.	1
Rishiri To, Hokkaido	45°14'00"N., 141°10'00"E.	Rebun To, Hokkaido	45°17'00"N., 141°03'00"E.	1
Haboro (Tomamai), Hokkaido	44°19'30"N., 141°39'30"E.	Yagishiri Jima, Hokkaido	44°26'20"N., 141°25'25"E.	
Yagishiri Jima, Hokkaido	44°26'20"N., 141°23'00"E.	Teuri Jima, Hokkaido	44°26'30"N., 141°19'30"E.	1
Nemuro, Hokkaido	43°19'37"N., 145°34'04"E.	Keramoi Zaki, Kunashiri Jima Kurile Islands	43°39'30"N., 145°33'10"E.	1
Shiranuka Wan, Kunashiri Jima, Kurile Islands	44°22'30"N., 146°27'15"E.	Kushibetsu, Etorofu Jima, Kurile Is.	44°32'20"N., 146°57'00"E.	1
Muroran, Hokkaido	42°18'57"N. 140°58'13"E.	Suna Saki, Hokkaido	42°08'00"N., 140°43'40"E.	3
Kuto (Hamanaka), Hokkaido	42°13'00"N., 139°52'00"E.	Okushiri Jima, Hokkaido	42°12'20"N., 139°32'10"E.	1

2. Tsugaru Straits.

From	Location of landing	To	Location of landing	No. of cables
Hakodate (Koyasu), Hokkaido	41°44'00"N., 140°55'50"E.	Oma Zaki, Aomori Pref.	41°31'15"N., 140°57'00"E.	1

From	Location of landing	To	Location of landing	No. of cables
Hakodate, Hokkaido	41°45'45"N., 140°44'15"E.	Sai, Aomori Pref.	41°26'00"N., 140°51'45"E.	2
Hakodate, Hokkaido	41°45'45"N., 140°44'15"	Aomori, Aomori Pref.	40°50'05"N., 140°48'00"E.	3
Hakodate (Kattoshi Zaki), Hokkaido	41°44'00"N., 140°35'15"E.	Tairadate (Ishi Zaki), Aomori Pref.	41°10'45"N., 140°38'30"E.	3
Kikonai, Hokkaido	41°40'00"N., 140°26'30"E.	Tairadate (Ippongi), Aombri Pref.	41°12'00"N., 140°31'15"E.	3
Fukushima, Hokkaido	41°28'30"N., 140°15'35"E.	Tappi Zaki, Aomori Pref.	41°13'15"N., 140°24'30"E.	1

3. Honshu (northern Japan Sea coast).

From	Location of landing	To	Location of landing	No. of cables
Teradomari, Niigata Pref.	37°38'00"N., 138°46'00"E.	Akadomari, Sado Shima, Niigata Pref.	37°51'40"N., 138°24'00"E.	3

4. Tokyo Bay, Nampo Shoto.

From	Location of landing	To	Location of landing	No. of cables
Futtsu Zaki, Chiba Pref.	35°18'30"N., 139°48'30"E.	Yokosuka (Kannon Zaki), Kanagawa Pref.	35°15'30"N., 139°44'00"E.	5
(Military cables between Tokyo Bay fortifications)				
Yokosuka (Senda Saki), Kanagawa Pref.	35°12'40"N., 139°44'00"E.	Kanaya, Chiba Pref.	35°10'10"N., 139°49'00"E.	5
Kamakura, Kanagawa Pref.	35°18'15"N., 139°32'50"E.	Chichi Jima, Nampo Shoto	27°05'25"N., 142°11'20"E.	1
Chichi Jima, Nampo Shoto	27°05'25"N., 142°11'20"E.	Guam	13°26'00"N., 144°38'00"E.	1
Chichi Jima, Nampo Shoto	27°05'25"N., 142°11'20"E.	Haha Jima, Nampo Shoto	26°38'00"N., 142°09'15"E.	1
Yokosuka (Yahagi), Kanagawa Pref.	35°11'00"N., 139°37'10"E.	O Shima, Izu Shichito, Nampo Shoto	34°45'20"N., 139°21'00"E.	1
Suno Saki, Chiba Pref.	34°58'20"N., 140°47'00"E.	O Shima, Izu Shichito, Nampo Shoto	34°45'20"N., 139°21'00"E.	1
Kawazu, Shizuoka Pref.	34°44'40"N., 139°00'20"E.	O Shima, Izu Shichito, Nampo Shoto	34°45'20"N., 139°21'00"E.	1
Kawazu, Shizuoka Pref.	34°44'40"N., 139°00'20"E.	Nii Jima, Izu Shichito, Nampo Shoto	34°22'45"N., 139°15'30"E.	1

From	Location of Landing	To	Location of landing	No. of Cables
Nii Jima, Izu Shichito, Nampo Shoto	34°22'45"N., 139°16'45"E.	Miyake Jima, Izu Shichito, Nampo Shoto	34°08'00"N., 139°31'12"E.	1
Miyake Jima, Izu Shichito, Nampo Shoto	34°07'10"N., 139°31'12"E.	Hachijo Jima, Izu Shichito, Nampo Shoto	30°08'00"N., 139°48'00"E.	1

5. Honshu (western Japan Sea coast), Oki Retto.

From	Location of Landing	To	Location of landing	No. of Cables
Chikumi, Shimane Pref.	35°33'30"N., 133°08'30"E.	Utsuryo To, Korea	37°28'35"N., 130°54'00"E.	1
Utsuryo To, Korea	37°28'35"N., 130°54'00"E.	Genzan, Korea (via Suigen Tan, Korea 38°40'30"N., 128°20'40"E.)	39°11'12"N., 127°29'00"E.	1
Chikumi, Shimane Pref.	35°33'30"N., 133°08'30"E.	Nakano Shima, Oki Retto	36°03'54"N., 133°06'40"E.	1
Nakano Shima, Oki Retto	36°03'54"N., 133°06'40"E.	Saigo, Dogo Shima, Oki Retto	36°11'47"N., 133°21'18"E.	2
Oashiura, Shimane Pref.	35°33'00"N., 133°02'50"E.	Nakano Shima, Oki Retto	36°03'54"N., 133°06'40"E.	1
Chikumi, Shimane Pref.	35°33'30"N., 133°08'30"E.	Saigo, Dogo Shima, Oki Retto	36°11'47"N., 133°21'18"E.	1

6. Inland Sea (eastern part).

From	Location of Landing	To	Location of landing	No. of Cables
Wakayama (Ogawa), Wakayama Pref.	34°18'20"N., 135°04'50"E.	Tomoga Shima, Wakayama Pref.	34°16'55"N., 135°00'30"E.	2
Tomoga Shima Wakayama Pref.	34°16'55"N., 135°00'30"E.	Yura, Awaji Shima, Hyogo Pref.	34°18'00"N., 134°56'05"E.	3
Fukura, Awaji Shima, Hyogo Pref.	34°12'50"N., 134°42'40"E	Muya, Tokushima Pref., Shikoku	34°10'20"N., 134°38'00"E.	3
Kobe (Nishi Suma), Hyogo Pref.	34°38'00"N., 135°05'30"E.	Iwaya (Kusunaki), Awaji Shima, Hyogo Pref.	34°33'20"N., 135°00'20"E.	3
Kobe (Nishi Suma), Hyogo Pref.	34°38'00"N., 135°05'30"E.	Iwaya, Awaji Shima, Hyogo Pref.	34°35'00"N., 135°01'00"E.	1

From	Location of landing	To	Location of landing	No. of cables
Akashi (Tarumi), Hyogo Pref.	34°37'30"N., 135°03'00"E.	Iwaya, Awaji Shima, Hyogo Pref.	34°35'00"N., 135°01'00"E.	3
Aboshi, Hyogo Pref.	34°46'15"N., 134°32'40"E.	Nishi Shima, Hyogo Pref.	34°39'30"N., 134°38'50"E.	1
Takamatsu (Takai Hana), Kagawa Pref., Shikoku	34°24'50"N., 134°08'00"E.	Shodo Shima, Kagawa Pref.	34°27'53"N., 134°09'40"E.	3
Takamatsu (Aji), Kagawa Pref., Shikoku	34°23'40"N., 135°07'27"E.	O Shima, Kagawa Pref.	34°24'12"N., 134°06'42"E.	
Shodo Shima, Kagawa Pref.	34°29'04"N., 134°09'17"E.	Te Shima, Kagawa Pref.	34°29'08"N., 134°06'20"E.	1
Uno, Okayama Pref.	34°29'30"N., 133°58'00"E.	Nao Shima, Kagawa Pref.	34°28'30"N., 133°58'10"E.	2
Uno (Hibi), Okayama Pref., Honshu	34°27'07"N., 133°56'25"E.	Marugame (Osakino Hana), Kagawa Pref., Shikoku	34°22'53"N., 133°55'42"E.	3
Shibukawa, Okayama Pref., Honshu	34°27'10"N., 133°54'18"E.	No Saki, Kagawa Pref., Shikoku	34°22'40"N., 133°54'10"E.	6
Sakaide, Kagawa Pref.	34°19'30"N., 133°50'10"E.	Hon Shima, Kagawa Pref.,	34°22'45"N., 133°47'07"E.	1
Koda Hana, Kagawa Pref.	34°14'05"N., 133°38'16"E.	Awa Shima, Kagawa Pref.,	34°15'30"N., 133°37'54"E.	1
Kasaoka (Kono Shima), Okayama Pref.	34°26'53"N., 133°31'38"E.	Kitagi Shima, Okayama Pref.	34°23'30"N., 133°33'22"E.	1

7. Inland Sea (Central part).

(Many of the thickly-clustered islands in the Central Inland Sea are connected by overhead telegraph wires)

From	Location of landing	To	Location of landing	No. of cables
Onomichi (Mukai Jima), Hiroshima Pref.	34°21'30"N., 133°11'12"E.	Inno Shima, Hiroshima Pref.	34°20'10"N., 133°11'12"E.	4

From	Location of landing	To	Location of landing	No. of cables
Inno Shima, Hiroshima Pref.	34°16'32"N., 133°11'21"E.	Yuge Shima, Ehime Pref.	34°16'12"N., 133°11'52"E.	1
Ikuchi Shima, Hiroshima Pref.	34°17'05"N., 133°04'08"E.	Omi Shima, Ehime Shima	34°16'32"N., 133°01'51"E.	2
Tadanomi, Hiroshima Pref.	34°19'40"N., 133°00'17"E.	Ikuchi Jima, Hiroshima Pref.	34°17'05"N., 133°04'08"E.	1
Tadanomi, Hiroshima Pref.	34°19'50"N., 132°59'50"E.	Okuno Shima, Hiroshima Pref.	34°18'37"N., 132°59'20"E.	1
Okuno Shima Hiroshima Pref.	34°18'37"N., 132°59'20"E.	Omi Shima, Ehime Pref.	34°17'50"N., 133°00'20"E.	1
Omi Shima, Ehime Pref.	34°15'20"N., 133°02'50"E.	Hakata Shima, Ehime Pref.	34°13'56"N., 133°03'56"E.	2
Hakata Shima, Ehime Pref.	34°17'41"N., 133°05'44"E.	O Shima, Ehime Pref.	34°11'25"N., 133°05'03"E.	1
Niihama, Ehime Pref.	33°57'05"N., 133°14'40"E.	Mino Shima, Ehime Pref.	34°06'23"N., 133°11'06"E.	1
Imabari, Ehime Pref.	34°03'09"N., 133°01'00"E.	O Shima, Ehime Pref.	34°07'07"N., 133°02'09"E.	2
Imabari (Hashihama), Ehime Pref.	34°07'00"N., 132°57'30"E.	Omi Shima, Ehime Pref.	34°12'45"N., 133°02'17"E.	1
Takehara, Hiroshima Pref.	34°19'30"N., 132°55'00"E.	Osaki Kami Shima, Hiroshima Pref.	34°17'00"N., 132°55'32"E.	2
Osaki Kami Shima, Hiroshima Pref.	34°13'00"N., 132°50'25"E.	Osaki Shimo Shima, Hiroshima Pref.	34°11'35"N., 132°50'19"E.	2
Nikata (Toda), Hiroshima Pref.	34°12'12"N., 132°38'17"E.	Shimo Kamegari Shima, Hiroshima Pref.	34°11'40"N., 132°38'51"E.	3
Shimo Kamagari Shima, Hiroshima Pref.	34°10'11"N., 132°39'28"E.	Koguro Jima, Hiroshima Pref.	34°09'28"N., 132°39'09"E.	2
Kure (Hiro), Hiroshima Pref.	34°12'08"N., 132°34'07"E.	Koguro Jima, Hiroshima Pref.	34°09'00"N., 132°38'45"E.	1
Koguro Jima, Hiroshima Pref.	34°09'05"N., 132°38'54"E.	Oai Jima, Hiroshima Pref.	34°04'22"N., 132°42'12"E.	1

From	Location of landing	To	Location of landing	No. of cables
Kure (Hiro), Hiroshima Pref.	34°12'08"N., 132°34'07"E.	Yanagihara, Ehime Pref.	33°57'06"N., 132°45'49"E.	2
Kure (Yoshiura), Hiroshima Pref.	34°15'35"N., 132°30'40"E.	Eta Jima, Hiroshima Pref.	34°15'35"N., 132°29'30"E.	4
Eta Jima, Hiroshima Pref.	34°14'48"N., 132°25'40"E.	Nishi Nomi Jima, Hiroshima Pref.	34°14'40"N., 132°25'30"E.	1
Higashi Nomi Jima, Hiroshima Pref.	34°09'20"N., 132°29'05"E.	Kurahashi Jima, Hiroshima Pref.	34°09'22"N., 132°29'20"E.	1
Hiroshima (Ujina), Hiroshima Pref.	34°20'30"N., 132°27'20"E.	Nino Shima, Hiroshima Pref.	34°19'10"N., 132°26'30"E.	1
Nino Shima, Hiroshima Pref.	34°17'40"N., 132°26'10"E.	Eta Jima, Hiroshima Pref.	34°16'18"N., 132°26'16"E.	1
Matsuyama (Mitsugahama), Ehime Pref.	33°53'12"N., 132°42'32"E.	Gogo Shima, Ehime Pref.	33°53'52"N., 132°41'16"E.	2
Gogo Shima, Ehime Pref.	34°54'20"N., 132°40'40"E.	Naka Shima, Ehime Pref.	34°57'20"N., 132°37'30"E.	2
Naka Shima, Ehime Pref.	33°58'55"N., 132°35'57"E.	Nuwa Shima, Ehime Pref.	33°59'09"N., 132°33'36"E.	1
Ajina, Hiroshima Pref.	34°19'15"N., 132°18'42"E.	Itsuku Shima, Hiroshima Pref.	34°18'15"N., 132°19'15"E.	4
Otake, Hiroshima Pref.	34°13'30"N., 132°14'00"E.	Atada Shima, Hiroshima Pref.	34°11'25"N., 132°17'20"E.	1
Obatake, Yamaguchi Pref.	33°58'45"N., 132°11'40"E.	Yashiro Jima, Yamaguchi Pref.	33°57'30"N., 132°12'52"E.	5

8. <u>Inland Sea (western part), Bungo Suido</u>.

From	Location of landing	To	Location of landing	No. of cables
Murozumi, Yamaguchi Pref.	33°56'54"N., 131°57'07"E.	Kunoura, Oita Pref.	33°38'45"N., 131°40'30"E.	1
Kunoura (Kushiko), Oita Pref.	33°41'05"N., 131°36'10"E.	Hime Shima, Oita Pref.	33°43'15"N., 131°38'12"E.	1

From	Location of landing	To	Location of landing	No of cables
Misaki, Ehime Pref.	33°22'05"N., 132°06'50"E.	Oita (Saganoseki), Oita Pref.	33°13'25"N., 131°52'50"E.	4
Oita (Saganoseki), Oita Pref.	33°14'30"N., 131°13'40"E.	Taka Shima, Oita Pref.	33°16'25"N., 131°56'35"E.	2
Uwajima, Ehime Pref.	33°11'55"N., 132°23'47"E.	To Shima, Ehime Pref.	33°11'30"N., 132°21'40"E.	1
To Shima, Ehime Pref.	33°11'50"N., 132°21'30"E.	Hiburi Shima, Ehime Pref.	33°10'10"N., 132°17'55"E.	1
Saeki (Taurumi Saki), Oita Pref.	32°56'45"N., 132°03'25"E.	O Shima, Oita Pref.	32°57'25"N., 132°04'10"E.	2
Onoda, Yamaguchi Pref.	33°57'12"N., 131°09'30"E.	Moji (Ozumi), Fukuoka Pref.	33°56'11"N., 131°00'10"E.	1
Onoda, Yamaguchi Pref.	33°57'12"N., 131°09'30"E.	Moji (Karita), Fukuoka Pref.	33°48'13"N., 130°59'15"E.	1
Shimonoseki (Sotoura), Yamaguchi Pref.	33°59'23"N., 130°59'18"E.	Moji (Tano), Fukuoka Pref.	33°57'48"N., 131°00'00"E.	10

9. Western Honshu.

From	Location of landing	To	Location of landing	No of cables
Kottoi, Yamaguchi Pref.	34°20'12"N., 130°53'40"E.	Tsuno Shima, Yamaguchi Pref.	34°21'00"N., 130°51'40"E.	2
Tsuno Shima, Yamaguchi Pref.	34°21'06"N., 130°51'30"E.	Mi Shima, Yamaguchi Pref.	34°46'57"N., 131°09'05"E.	1
Tsuno Shima, Yamaguchi Pref.	34°21'00"N., 130°51'40"E.	Okino Shima, Fukuoka Pref.	34°14'12"N., 130°06'22"E.	1
Okino Shima, Fukuoka Pref.	34°14'12"N., 130°06'22"E.	Kechi, Tsushima, Nagasaki Pref.	34°16'15"N., 129°20'00"E.	1
Shimonoseki (Murotsu), Yamaguchi Pref.	34°08'02"N., 130°53'10"E.	Fusan, Korea	35°07'26"N., 129°07'11"E.	1
Shimonoseki (Yoshimi), Yamaguchi Pref.	34°03'30"N., 130°54'45"E.	Fusan, Korea	35°04'30"N., 129°01'19"E.	5
Shimonoseki (Takenoko Jima), Yamaguchi Pref.	33°56'54"N., 130°52'35"E.	Mutsure Jima, Yamaguchi Pref.	33°58'03"N., 131°52'07"E.	2

From	Location of landing	To	Location of landing	No. of cables
Shimonoseki (Hiko Shima), Yamaguchi Pref.	33°56'32"N., 130°52'44"E.	Aino Shima, Yamaguchi Pref.	35°59'40"N., 130°49'10"E.	1
Aino Shima, Yamaguchi Pref.	33°59'40"N., 130°49'10"E.	Futaoi Shima, Yamaguchi Pref.	34°05'40"N., 130°48'00"E.	1
Shimonoseki (Tanokubi), Yamaguchi Pref.	33°54'40"N., 130°55'33"E.	Moji (Dairi), Fukuoka Pref.	33°53'56"N., 130°55'45"E.	8
Shimonoseki (Fukuura), Yamaguchi Pref.	33°54'56"N., 131°54'13"E.	Moji (Akasaka), Fukuoka Pref.	33°53'20"N., 130°54'26"E.	6

10. Northern Kyushu, Tsushima.

From	Location of landing	To	Location of landing	No. of cables
Konominato Fukuoka Pref.	33°50'55"N., 130°29'20"E.	O Shima, Fukuoka Pref.	33°53'24"N., 130°26'05"E.	1
Nogita, Fukuoka Pref.	33°37'25"N., 130°09'50"E.	Indoji, Iki Shima, Nagasaki Pref.	33°44'15"N., 129°46'45"E.	1
Yobuko, Saga Pref.	33°32'30"N., 129°54'35"E.	Indoji, Iki Shima, Nagasaki Pref.	33°44'15"N., 129°46'45"E.	1
Yobuko, Saga Pref.	33°32'30"N., 129°54'35"E.	Kechi, Tsushima, Nagasaki Pref.	34°16'15"N., 129°20'00"E.	1
Yobuko, Saga Pref.	33°32'30"N., 129°54'35"E.	Gonoura, Iki Shima, Nagasaki Pref.	33°43'45"N., 129°40'50"E.	2
Gonoura, Iki Shima, Nagasaki Pref.	33°43'45"N., 129°40'50"E.	Izuhara, Tsushima, Nagasaki Pref.	34°11'45"N., 129°17'40"E.	2
Gonoura (Hansei Ura), Iki Shima, Nagasaki Pref.	33°46'10"N., 129°40'45"E.	Kechi, Tsushima, Nagasaki Pref.	34°16'15"N., 129°20'00"E.	1
Gonoura, Iki Shima, Nagasaki Pref.	33°43'45"N., 129°40'50"E.	Tsutsu (Sotohama), Tsushima, Nagasaki Pref.	34°06'30"N., 129°12'50"E.	1
Gonoura (Mushosu), Iki Shima, Nagasaki Pref.	33°43'10"N., 129°39'30"E.	Naga Shima, Iki Shima, Nagasaki Pref.	33°43'10"N., 129°39'30"E.	1
Kazamoto Iki Shima, Nagasaki Pref.	33°50'30"N., 129°41'00"E.	Nyaku Shima, Iki Shima, Nagasaki Pref.	33°51'45"N., 129°41'10"E.	2

From	Location of landing	To	Location of landing	No. of cables
Tsutsu (Sotohama), Tsushima, Nagasaki Pref.	34°06'30"N., 129°12'50"E.	Kyosai To, Korea	35°00'35"N., 128°42'30"E.	1
Komoda, Tsushima, Nagasaki Pref.	34°13'55"N., 129°11'35"E.	Fusan, Korea	35°04'30"N., 129°01'19"E.	1
Go Saki, Tsushima, Nagasaki Pref.	34°19'20"N., 129°13'08"E.	Fusan, Korea	35°04'30"N., 129°01'19"E.	2
Go Saki, Tsushima, Nagasaki Pref.	34°19'20"N., 129°13'08"E.	Kyosai To, Korea	35°00'35"N., 128°42'30"E.	1
Hoshiga Saga Pref.	33°26'34"N., 129°47'34"E.	Taka Shima, Saga Pref.	33°25'55"N., 129°47'00"E.	2
Kamada, Nagasaki Pref	33°22'45"N., 129°36'00"E.	Azuchi O Shima, Nagasaki Pref.	33°28'14"N., 129°32'25"E.	1
Hinoura, Nagasaki Pref.	33°21'23"N., 129°34'42"E.	Hirado Shima, Nagasaki Pref.	33°21'22"N., 129°34'07"E.	3
Hirado Shima, Nagasaki Pref.	33°23'52"N., 129°32'10"E.	Taku Shima, Nagasaki Pref.	33°25'30"N., 129°31'00"E.	1
Taku Shima, Nagasaki Pref.	33°25'30"N., 129°31'00"E.	Azuchi O Shima, Nagasaki Pref.,	33°28'14"N., 129°32'25"E.	1
Hirado Shima, Nagasaki Pref.	33°20'55"N., 129°28'00"E.	Ikitsuki Shima, Nagasaki Pref.,	33°21'48"N., 129°26'20"E.	1

11. Western Kyushu.

From	Location of landing	To	Location of landing	No. of cables
Sasebo, Nagasaki Pref.	33°09'10"N., 129°40'48"E.	Dairen, Manchuria	38°52'35"N., 121°33'25"E.	1
Sasebo, Nagasaki Pref.	33°90'10"N., 129°40'48"E.	Tsingtao, China.	36°01'00"N., 120°18'00"E.	1
Sasebo (Kogo Saki), Nagasaki Pref.	33°06'00"N., 129°40'15"E.	Kakinoura Shima, (Mitoko Shima), Nagasaki Pref.	33°00'22"N., 129°32'25"E.	1
Kakinoura Shima (Mitoko Shima), Nagasaki Pref.	33°00'22"N., 129°32'25"E.	Odate Shima, Nagasaki Pref.,	33°01'00"N., 129°26'12"E.	1

From	Location of landing	To	Location of landing	No. of cables
Odate Shima, Nagasaki Pref.	33°01'00"N., 129°26'12"E.	Eno Shima, Nagasaki Pref.,	33°00'25"N., 129°21'30"E.	1
Eno Shima, Nagasaki Pref.	33°00'05"N., 129°20'44"E.	Nira Shima, Nagasaki Pref.,	33°00'13"N., 129°15'14"E.	1
Hira Shima, Nagasaki Pref.	32°59'10"N., 129°14'20"E.	Nakadori Shima, Goto Retto, Nagasaki Pref.	32°59'45"N., 129°10'50"E.	1
Tainoura (Hario Seto), Nagasaki Pref.	33°04'38"N., 129°44'27"E.	Kogari (Hario Seto), Nagasaki Pref.	33°04'21"N., 129°43'52"E.	
Kuroguchi, Nagasaki Pref.	33°03'17"N., 129°39'53"E.	Kurose, O Shima, Nagasaki Pref.	33°03'24"N., 129°38'21"E.	3
Nakaura Nagasaki Pref.	33°00'29"N., 129°39'23"E.	Kakinoura Shima, Nagasaki Pref.	33°01'17"N., 129°35'20"E.	1
Ono Hana, Nagasaki Pref.	32°58'32"N., 129°37'57"E.	Kakinoura Shima, Nagasaki Pref.	33°01'17"N., 129°35'20"E.	1
Kakinoura Shima, Nagasaki Pref.	33°01'30"N., 129°33'52"E.	Nakadori Shima, Goto Retto, Nagasaki Pref.	32°59'52"N., 129°09'00"E.	1
Itaura, Nagasaki Pref.	32°56'15"N., 129°38'31"E.	Matsushima, Matsu Shima, Nagasaki Pref.	32°56'05"N., 129°37'34"E.	
Nagasaki (Ha Saki), Nagasaki Pref.	32°45'53"N., 129°48'07"E.	Fukae (Fukue), Fukae Jima, Goto Ratto Nagasaki Pref.	32°42'18"N., 128°50'42"E.	2
Fukae, Fukae Jima, Goto Retto, Nagasaki Pref.	32°42'18"N., 128°50'42"E.	Nakadori Shima Goto Retto, Nagasaki Pref.	32°50'20"N., 129°03'03"E.	1
Hirose, Nakadori Shima, Goto Retto, Nagasaki Pref.	33°02'17"N., 129°04'55"E.	Ojika Shima, Goto Retto, Nagasaki Pref.	33°11'30"N., 129°04'50"E.	1
Ojika Shima Goto Retto, Nagasaki Pref.	33°12'40"N., 129°04'45"E	Uku Shima, Goto Retto, Nagasaki Pref.	33°15'36"N., 129°05'30"E.	1
Nagasaki (Kosedo), Nagasaki Pref.	32°43'23"N., 129°50'01"E.	Kamino Shima, Nagasaki Pref.,	32°43'13"N., 129°49'53"E.	2

From	Location of landing	To	Location of landing	No. of cables
Kamino Shima, Nagasaki Pref.	32°43'13"N., 129°49'53"E.	Kageno Shima, Nagasaki Pref.,	32°42'07"N., 129°49'41"E.	1
Nagasaki (Ogakura), Nagasaki Pref.	32°41'57"N., 129°50'52"E.	Vladivostok, Siberia	43°07'00"N., 131°53'00"E.	2
Nagasaki (Ogakura), Nagasaki Pref.	32°41'57"N., 129°50'52"E.	Shanghai, China	31°22'30"E., 121°30'25"E.	2
Nagasaki (Doinokubi), Nagasaki Pref.	32°41'37"N., 129°50'15"E.	Mategaura, Koyagi Shima, Nagasaki Pref.	32°41'12"N., 129°49'30"E.	2
Fukahori, Nagasaki Pref.	32°40'24"N., 129°49'10"E.	Taka Shima, Nagasaki Pref.,	32°39'37"N., 129°45'40"E.	1
Taka Shima (Futago Shima), Nagasaki Pref.	32°38'47"N., 129°45'30"E.	Ha Shima, Nagasaki Pref.,	32°39'37"N., 129°45'40"E.	1
Nagasaki (Mogi), Nagasaki Pref.	32°01'30"N., 129°55'00"E.	Dairen, Manchuria	38°52'35"N., 121°33'25"E.	1
Nagasaki (Mogi), Nagasaki Pref.	32°01'30"N., 129°55'00"E.	Shanghai, China	31°22'30"N., 121°30'25"E.	1
Nagasaki (Mogi), Nagasaki Pref.	32°01'30"N., 129°55'00"E.	Tamsui, Formosa	25°11'20"N., 121°24'40"E.	2
Higashi Arie, Nagasaki Pref.	32°39'00"N., 130°18' E.	Amakusa Shimo Jima, Kumamoto Pref.	32°30'00"N., 130°11'45"E.	1
Nagasu, Kumamoto Pref.	32°55'00"N., 130°27'32"E.	Shimabara, Nagasaki Pref.,	32°49'00"N., 130°20'32"E.	1
Yanagiura, Oyano Shima, Kumamoto Pref.	32°32'52"N., 130°26'33"E.	Amakusa Kami Jima, Kumamoto Pref.	32°31'34"N., 130°26'17"E.	4
Osukui, Kagoshima Pref.	32°06'55"N., 130°11'18"E.	Kasedo, Naga Shima, Kagoshima Pref.	32°07'23"N., 130°10'22"E.	2
Kushikino, Kagoshima Pref.	31°43'35"N., 130°15'11"E.	Kami Koshiki Jima, Kagoshima Pref.	31°49'00"N., 129°52'33"E.	1

From	Location of landing	To	Location of landing	No. of cables
Kami Koshiki Jima, Kagoshima Pref.	31°49'00"N., 129°52'33"E.	Shimo Koshiki Jima, Kagoshima Pref.	31°42'10"N., 129°44'36"E.	1

12. Southern Kyushu, Nansei Shoto.

From	Location of landing	To	Location of landing	No. of cables
Kagoshima, Kagoshima Pref.	31°36'40"N., 130°34'39"E.	Sakura Jima, Kagoshima Pref.	31°36'00"N., 130°36'45"E.	2
Kagoshima, Kagoshima Pref.	31°32'46"N., 130°32'48"E.	Ohama, Kagoshima Pref.	31°11'00"N., 130°46'05"E.	2
Ohama, Kagoshima Pref.	31°11'00"N., 130°46'05"E.	Tanega Shima, Nansei Shoto	30°43'14"N., 130°59'43"E.	1
Tanega Shima, Nansei Shoto	30°43'14"N., 130°59'43"E.	Yaku Shima, Nansei Shoto	30°25'11"N., 130°34'50"E.	1
Ohama, Kagoshima Pref.	31°11'00"N., 130°46'05"E.	Nishikomi Amami O Shima, Nansei Shoto	28°14'30"N., 129°09'48"E.	1
Nishikomi, Amami O Shima, Nansei Shoto	28°14'30"N., 129°09'48"E.	Katena, Okinawa Jima, Nansei Shoto	26°21'40"N., 127°44'35"E.	1
Katena, Okinawa Jima, Nansei Shoto	26°21'40"N., 127°44'35"E.	Ishigaki Jima, Nansei Shoto	24°25'00"N., 124°05'22"E.	1
Ishigaki Jima, Nansei Shoto	24°25'00"N., 124°05'22"E.	Tamsui, Formosa	25° 11'20"N., 121°24'40"E.	1
Nishikomi, Amami O Shima, Nansei Shoto	28°14'30"N., 129°09'48"E.	Tokuno Shima, Nansei Shoto	27°48'25"N., 128°53'40"E.	1
Tokuno Shima, Nansei Shoto	27°44'14"N., 129°01'22"E.	Okinoerabu Jima, Nansei Shoto	27°24'50"N., 128°41'00"E.	1
Akaogi, Amami O Shima, Nansei Shoto	28°24'24"N., 129°37'58"E.	Kikai Jima, Nansei Shoto	28°19'36"N., 128°57'18"E.	1
Nishikomi, Amami O Shima, Nansei Shoto	28°14'30"N., 129°09'48"E.	Kakeroma Shima, Nansei Shoto	28°11'12"N., 129°11'20"E.	1

From	Location of landing	To	Location of landing	No. of Cables
Amami O Shima, Nansei Shoto	28°09'16"N., 129°17'50"E.	Kakeroma Shima, Nansei Shoto	28°09'35"N., 129°16'20"E.	1
Amami O Shima, Nansei Shoto	28°07'34"N., 129°22'03"E.	Kakeroma Shima, Nansei Shoto	28°06'42"N., 129°20'34"E.	1
Itoman, Okinawa Jima, Nansei Shoto	26°07'30"N., 127°40'20"E.	Yap, Mandated Islands	9°30'00"N., 138°10'00"E.	1
Okinawa Jima, Nansei Shoto	26°17'50"N., 127°54'27"E.	Tauken Jima, Okinawa Jima, Nansei Shoto	26°15'04"N., 127°56'22"E.	1
Miyako Jima, Nansei Shoto	24°52'30"N., 125°18'00"E.	Erabu Jima, Nansei Shoto	24°50'00"N., 125°14'14"E.	1
Miyako Jima, Nansei Shoto	24°42'55"N., 125°19'15"E.	Ishigaki Jima, Nansei Shoto	24°25'00"N., 124°05'22"E.	1
Ishigaki Jima, Nansei Shoto	24°25'00"N., 124°05'22"E.	Iriomoto Jima, Nansei Shoto	24°22'20"N., 123°43'25"E.	1

Appendix V

DETAILS OF TELEPHONE CABLES

1. The Tokyo-Kobe loaded cable (completed November 1, 1928).--

a. Design.-- Circuit. Intermediate loading coils are inserted in the cable circuit at distances of approximately 6,000 feet, and telephone repeater stations are employed at distances of from 60 to 90 miles, according to the length and kind of circuit. When the distance between two terminal stations does not exceed 250 miles, so-called two-wire telephone circuits are used, each circuit consisting of two wires (a pair) of a cable and equipped with two-wire telephone repeaters, suitably spaced. When this distance exceeds 250 miles, so-called four-wire telephone circuits are used as standard, each circuit consisting of four wires (two pairs) of a cable and equipped with four-wire telephone repeaters, suitably spaced. Two-wire circuits are used between Tokyo and Nagoya. Four-wire circuits are used between Tokyo and Kyoto, and between Tokyo and Osaka.

Cable plan. It was decided to use a cable containing a total of 184 pairs of wire: 54 pairs of 1.3-millimeter (No. 16, American Wire Gauge) wire suitable for two-wire circuits, and 130 pairs of 0.9 millimeter (No. 19, American Wire Gauge) wire for four-wire circuits and two-wire circuits of short length. The cable is quadded, paper-insulated, and lead-covered.

Loading coil arrangement. Each loading point is equipped with one loading coil case for 27 quads (all for two-wire circuits), one case for 35 quads (all for four-wire circuits), and one case for 30 quads (21 quads for four-wire circuits and 9 quads for two-wire circuits). The coils are designed to give the following inductance value to each pair of a quad:

Kinds	Standard value of inductance (Millihenrys) 2-wire circuits	4-wire circuits	Remarks
For side circuit.........	177	178	Measured by A.C., 2 milliamps., 1800 cycles.
For phantom circuit......	107	64	Allowable limits, 2%.

For a phantom circuit formed by each loading unit, leakage between the coils including the leads, when measured with an alternating current of 900 cycles and 2 milliamperes, is within the following limits:

Kind of circuits	Maximum leakage (in C.G.S. units)	Average leakage
Between side circuits....	100	40
Between side and phantom circuits........	200	80

In the initial installation, one loading coil case for 27 quads was installed at every loading point in each division completed, thus opening telephone traffic in the division and utilizing the completed cable as much as possible. (Illustration 33). With the completion of the cable installation between Tokyo and Kobe, loading coils for 35 quads were added, thereby making available four-wire circuits for toll telephone traffic over lines going to Kyoto,

Osaka, and Kobe from Tokyo and Yokohama. Loading coils for 30 quads were added subsequently. The loading coils adopted are of standard types with cores of compressed iron particles.

Telephone repeater stations. The telephone repeater stations are so designed that the station buildings and equipment can be accommodated to a second toll cable.

The two-wire repeaters are of the current type consisting of the usual vacuum tube two-way amplifier. (Illustration 34). Provision is made of auxiliary equipment such as current supply circuits, alarm circuits, and intermediate signaling circuits. The repeater has a maximum gain of approximately 19 decibels. A four-wire repeater is made up of two sets of amplifiers, each containing two vacuum tubes. One set is used for transmitting in each direction. Under normal conditions the repeater has a maximum gain of 42 decibels at 1,000 cycles. It is equipped with auxiliary current supply and alarm circuits, as is a two-wire repeater. In the case of a terminal station where it is necessary to connect four-wire circuits with subscribers' circuits, terminal equipment is provided. Power equipment and testing equipment are provided in addition to repeaters.

b. Construction features. Between Tokyo and Kobe about one-half of the cable line is placed overhead and the other half underground, aerial construction being used wherever feasible.

Overhead system. The overhead parts of the system are constructed as follows (allowing for the addition of a future cable):

Poles of 24-foot height impregnated with copper sulphate.

or creosote are used as standard. When the height exceeds 33 feet steel towers are used.

Standard pole spacing is 100 feet and when it exceeds 230 feet the cable is suspended by a catenary line.

For suspension a special steel stranded wire having a cross section of 65 square millimeters (0.1 square inch) and tensile strength of 7,300 kilograms (16,096 pounds) is used.

Reinforced concrete construction is used chiefly for loading coil towers, and in order to allow room for six loading coils, each tower is provided with a platform 18 feet by 15 feet.

Underground system. The underground system is constructed as follows:

A line of cast iron pipes, each having an internal diameter of 75 millimeters (3 inches), is buried in places where the water line is near the surface of the earth, and in other places two-holed earthen conduits or two-holed concrete conduits are used. In case cast iron pipes are used under a paved road or in other places where access is difficult, a spare pipe line is installed. Where roads are much curved or where conduits cannot be advantageously installed, armored cables are used.

Manholes are constructed either of reinforced concrete or of bricks, and provisions are made to prevent water from entering them. Where it is necessary to place loading coils in manholes, provision is made, corresponding to the overhead line procedure, to install six in one hole by constructing it 8 feet 6 inches long, 6 feet wide, and 10 feet deep, internal dimensions. (Illustration 38).

Manholes located where it is required to test the cable are constructed to internal dimensions of 6 feet long, 4 feet wide, and 4 feet 3 inches deep. Manholes in other places are constructed to smaller dimensions.

River crossings. In places where the cable crosses rivers, a field investigation was made in each case to determine whether overhead or underground construction should be adopted. In some cases, steel towers were put up on both banks and in rivers suspending the cable from catenary lines (illustration 39); and in other cases, special bridges for the cable were constructed, or the cable was strung along existing bridges. (Illustrations 40 and 41).

c. Cable route.— In general, the cable route is selected for laying along railways or highways. In parallel are telegraph, telephone, light and power lines of bare overhead construction. In addition, the route often has the sea on one side and mountains on the other, and in some places it crosses large rivers. In view of this situation, the cable had to be laid in safe zones separated a reasonable distance from the obstacles mentioned, with each loading point spaced exactly at 6,000 feet. Accordingly, in selecting the route, a careful survey was made for alternative routes. Many changes in routes were made, owing to the reconstruction of highways or bridges, or the construction of a building. In each case, the route between two repeater stations had to be re-surveyed because of the necessity for maintaining proper spacing for the loading coils. The decision was finally made to lay the cable as follows:

Tokyo-Yokohama section: Underground along the national highway.

Yokohama-Odawara section: Partly underground and partly overhead along the national highway.

Odawara-Numazu section: Since neither the old nor the new national highway in the Hakone district is suitable for an underground system, the section between Hakone-Yumoto and Ashino-yu is mostly of overhead construction through Takanosu Pass. The rest is also mostly of overhead construction, generally along the national highway.

Numazu-Shizuoka section: Mostly overhead along the railway between Numazu and Suzukawa; underground along the national highway between Suzukawa and Yui; overhead over Sassui Pass between Yui and Okitsu; partly underground and partly aerial between Okitsu and Shizuoka, mostly along the national highway.

Shizuoka-Tenryu Kawa section: Partly underground and partly overhead along the national highway.

Tenryu Kawa-Miyu section: As it is difficult to cross Lake Hamana, the cable leaves the national highway and is laid partly underground and partly overhead along a prefectural highway called the Old Hime Kaido across Honsaka Pass.

Miyu-Nagoya section: Mostly overhead along the national highway between Miyu and Okazaki, and along the prefectural highway through Tempaku between Okazaki and Nagoya; underground from the city limits of Nagoya to the Nagoya Station.

Nagoya-Kyoto section: Underground within the city limits of Nagoya, and thence overhead to Seki, along the Kansai railway line; overhead along the national highway from Saki to Kusatsu through Suzuka Pass, except over the pass where an armored cable is

used; underground from Kusatsu to Kyoto.

Kyoto-Osaka section: All underground along a prefectural highway called the Old Saikoku Kaido.

Osaka-Kobe section: All underground along the national highway.

Many dangers and difficulties were encountered in the transportation and installation of the cables and loading coils, inasmuch as the cable route traversed high and steep mountain passes such as the Hakone, Honsaka, and Suzuka, and large rivers such as Aka Gawa, Fuji Kawa, Oi Kawa, Tenryu Kawa, Kiso Gawa, Ibi Gawa, Seta Gawa, and Yodo Gawa.

d. Supply of principal materials.— Cable. As previously mentioned, the cable adopted is suitable for phantom working and consequently differs from suburban toll cable heretofore used in Japan for short distances, such as between subscribers in the same city or within the city boundary for incoming lines. Since home manufacturers had no experience in the manufacture of the type of cable required, the part employed between Tokyo and Odawara and also between Nagoya and Osaka, totaling approximately 61 miles, was supplied by the Western Electric Company. It was found afterward, however, that the Sumitomo Electric Wire and Cable Works, Ltd., the allied Cable Company of the Nippon Electric Company, Ltd., and others, after careful research into the method of cable manufacture, could produce cables equal to those imported. Consequently, cable manufactured locally was adopted for the entire remaining parts totaling 337 miles.

Loading coils.— The first loading coils used were imported. Subsequently, however, the Nippon Electric Company, Ltd., Tokyo, produced coils similar to those made in the United States. Coils manufactured in Japan have since been purchased along with imported coils.

Between Tokyo and Kobe, 698 cases of loading coils were used. Additional loading coils for 30-quad use between Tokyo and Osaka were installed during 1929.

Telephone repeaters. As no home manufacturer had had any experience in the manufacture of telephone repeaters, all the apparatus and materials installed initially at the Kameyama Repeater Station were supplied by the Western Electric Company, through the Nippon Electirc Company. In subsequent installations, however, only apparatus and materials which could not be manufactured in Japan were imported.

Miscellaneous. Such materials as cable hangers used in suspending the aerial portions of the cable, hanger connectors, and cable rings, estimated to be required between Tokyo and Shizuoka, were imported. Subsequently trial supplies were ordered from home makers and, inasmuch as they proved satisfactory, the home product has since been used exclusively.

The Tokyo-Mukden non-loaded telephone cable (completed in 1939).—a. The Tokyo-Mukden cable uses separate cables in the vicinity of the repeater stations to decrease near-end cross talk. The cable between repeater stations is shielded by tapes of metallized paper between the east and west-bound sections.

The submarine section between Fukuoka and Fusan, a distance of about 186 miles, is paper-insulated, lead-sheathed, and contains a number of pairs. Electromagnetic and electrostatic shielding, similar to that of the land cables, is used between the east and west-bound sections, but the conductors are a little heavier, 1.9 millimeters in diameter (slightly larger than No. 13 A.W.G.), paired. Repeater stations have been installed at Iki Shima and Tsushima. On each side of these stations two independent cables have been installed, and near the repeater stations, and at the bottom of the sea, a portion of the cable is shielded with a special alloy which has high permeability. The near-end cross talk is reduced by this shield.

Conversations carried on over the non-loaded cable circuits were found to be quite satisfactory. The advantage of the non-loaded cable lies in the fact that one cable pair may be employed for many circuits.

In comparing non-loaded and concentric (coaxial) cables, it is noted that in the case of the non-loaded cable, a number of channels are superimposed on many cable pairs, while in a concentric cable system a great many channels are superimposed on only one concentric cable. Consequently concentric cable systems are limited in scope in a communication network, although it has its place in television transmission.

With the completion of the Tokyo-Mukden non-loaded telephone the following 10 new telephone circuits have been established:

Tokyo-Keijo, Osaka-Fusan, Fukuoka-Keijo. These three circuits were added to the existing four radio and eight cable circuits.

Tokyo-Mukden, Tokyo-Dairen, Osaka-Dairen, Kobe-Dairen, Fukuoka-Mukden, Fukuoka-Harbin. These six circuits were added to the existing seven radio and eight cable circuits.

Tokyo-Tientsin. This circuit was added to the existing three radio and three cable circuits.

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