

The Metal Mining Industry in Japan

by Robert Y. Grant

This study outlines the history of metal mining in Japan and the characteristics of the industry as they existed from 1925 to 1945. Mining and milling operations are described together with the role of the Japanese Government. A description of post-hostilities conditions and the present state of the industry is included.

MANY of Japan's larger and better known mines date back to the early centuries of the Christian Era. The first stimulus to mining in Japan came through the growth of Buddhism, A. D. 600 to 700, and the attendant need for copper and other metals for temple ornaments and statues. During the Feudal period, 1333 to 1568, mine operations were expanded to meet the demand for ornament metal and for financing of campaigns. After removal of the seat of government from Kyoto to Tokyo, about 1600, the Tokugawa Shogunate placed great emphasis on mining, and many new mines were opened, some of which are still operating.

Toward the end of the Tokugawa period, mining had declined sharply from its earlier peak. The easily worked, high grade portions of the orebodies had been exhausted, and the mining techniques then available could not exploit the deeper, lower grade ores. Similarly, extraction of metal from the sulphide ores presented a major problem.

With the Meiji Restoration in 1868 and the rapid opening of the country to western ideas came a rejuvenation of the mining industry. Mining, milling, and smelting processes were greatly improved, resulting in the extension of development work into hitherto inaccessible portions of orebodies.

The demand for metal during World War I stimulated activity throughout the industry; copper mining, particularly, expanded to a point where Japan ranked second among world producers.* During the depression following the war, mining underwent a severe contraction in activity, recovering slowly during the late 1920's only to undergo a

further setback in the worldwide depression which started in 1929. Mineral output declined in 1930, but the beginning of Japanese expansion, 1931 to 1932, brought about an increase in the output of mine products starting between 1932 to 1934. Production continued to rise, the peak output being attained 1939 to 1943 in virtually all commodities. The greatest production of iron ore, chromite, and manganese was not experienced until 1944 when blocked imports, coupled with strong demands for steel, provided the needed incentive.

Through necessity, Japan produced much of her mineral needs from her own mines at high cost during World War II. Taking the 1932 to 1936 period as an average, however, Japanese mines produced only 16 pct of the iron available to industry, 8 pct of the lead, 33 pct of the zinc, and 68 pct of the copper.

Nearly all of Japan's output of gold, silver, copper, lead, and zinc between 1925 and 1945 came from 30 to 49 pct of the mines for which production data are available; for example, 66 of 174 gold-silver mines accounted for 98 pct of the output of this group. Further analysis of mine output indicates that a large part of Japan's metal output was derived from a few large mines; about 10 gold-silver, 15 copper, 3 lead-zinc, 5 manganese, and 2 iron mines account for most of the production. Many of these mines have been operated for 200 to 400 years. With the

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* John J. Collins: *Copper in Japan*, Natural Resources Section Report No. 106.

exception of the mines in Hokkaido, where settlement took place late, four of the five largest gold-silver mines were opened before 1660 and seven of the eight largest nonferrous metal mines were opened before 1690.

With increasing supply and manpower difficulties, gold mining was drastically curtailed in 1943, largely by cutting off allocation of supplies. About 50 pct of Japan's gold mines were closed and others suspended milling. Many gold mines were stripped of equipment, which was shipped to other mines in Japan or Korea.

Postwar recovery of the mining industry has been impressive, and much of it has been due to substantial loans from the Japanese Government and from funds supplied through various types of subsidy. Withdrawal of government loan support in the latter part of 1949 was more than compensated for by rising metal prices starting in mid-1950.

Between 1925 and 1945 Japanese metal mining operated with an abundant supply of inexpensive labor, a ready market for minerals, government controls, and a fair margin of profit guaranteed by subsidies. With conditions such as these, a study of the characteristics of the Japanese mines and the mining industry during the pre-1945 period will help toward an understanding of the industry in the post-Surrender days. Most of the operational methods discussed below are still in use.

Mining

Ore Grades: During 1925 to 1930, most mines operated on relatively high grade ore, but the better deposits were quickly exhausted, and from an examination of production records it is apparent that most mines in Japan handled low grade ore during the late 1930's and during the period of hostilities. As an example, of total reserves of 25,500,000 metric tons reported by the 38 largest gold-silver mines in 1945, 15,000,000 metric tons averaged 3.0 to 3.9 g of gold per ton, and 5,000,000 metric tons, from 2.0 to 2.9 g per ton. In one of the two largest copper mines, the grade of the milling ore dropped from 0.79 pct copper in 1940 to 0.68 pct in 1945. In the other mine, the crude ore grade dropped from 1.69 pct copper in 1940 to 0.91 pct copper in 1945. These copper mines are underground operations, not open pit.

Except in rare instances, geologic mapping and study in the mines were wholly inadequate to meet the need for more ore. Detailed geologic maps were virtually unknown, and studies of alteration or structure as guides for finding ore were nonexistent.

Extraction, Timbering and Drainage: In spite of low grade ore, mining practice in the metal mining industry was standard except for employment of a large proportion of hand labor. Drills were, in most cases, copies of American equipment, but lighter in weight. The use of wet stopers was almost unknown. A small amount of experimental work on detachable bits was done during the early 1940's, but since bits were not perfected, mines used standard drill steel. Cap and fuse blasting was the universal practice. Because of the lack of control in drilling and the mining of narrow veins, considerable over-breaking was experienced in almost all properties. Smaller producers or operators of mines working irregular or small deposits employed hand methods almost exclusively.

Almost no mechanical loaders were used, not even in tunnels or development headings; hand-loading was the rule, with hoe and pan arrangement instead

of the conventional shovel or scoop. The loaders rake the muck into a small two-handled pan with the hoe, lift the loaded pan, and empty it into a car. Timbering followed western practice, but almost all timber framing was done underground, with pine preferred.

Pumping practice was normal. Some Japanese mines are extremely wet, and in a few instances hot springs complicate the drainage problem, but the sharp relief facilitates mine drainage.

Haulage and Hoisting: Hand-tramming was practiced to a great extent, being used at mines where maximum annual output did not exceed 200,000 metric tons. Battery locomotives often were used for main haulage in the medium-sized Japanese mines, but in the few mines of over 300,000 tons per year capacity, trolley locomotives were the rule for main haulage; battery locomotives were employed in collecting. In most instances, the cars, including those used on main haulage, had a capacity of from 1 to 2 tons. In some larger mines 3-ton cars were used.

The largest amount of crude ore handled anywhere was in an iron mine which produced 1,147,000 metric tons in 1944. Most mines produced less than 500,000 tons of crude ore. The maximum output of the ten major producers is given in Table I.

Although in a few mines, skips were provided for main hoisting, most mines hoisted cars.

Mine Safety: Safety practice in the metal mines was not satisfactory by western standards, due as much to indifference on the part of the individual employee as to failure of management to require safe operating practices. The lack of interest in safety is reflected in the lack of information on pre-1945 accident rates available from Japanese Government records.

Mining Costs: Cost data are unsatisfactory because of poor cost accounting methods and because of incomplete information on labor force and on subsidy support. The operations of a few of the base metal mines showed an average mining and exploration cost amounting to 63 pct of the total, with hoisting and haulage accounting for 24 pct; pumping, 4 pct; and maintenance and timbering, 9 pct. Between 1930 and 1945 labor in mining operations accounted for 50 pct of the total cost, minerals about 25 pct, and electric power about 5 pct. The remaining 20 pct was divided among overhead charges and various incidental expenses. Among gold-silver mines the same cost breakdown was the rule.

Ore Dressing

Flotation plants were established at most of the larger nonferrous metal mines, but some produced direct smelting ore shipped after sizing and picking. Almost every mill contained a large hand-picking section. Cyanidation was employed at the gold-silver mines.

The largest flotation plant among the base metal mines had a capacity of 3000 tons per day. Among the cyanide plants the largest mill had a capacity of 2000 tons per day, in a mine which produced 740,211 tons in 1942, the year of largest output. Many of the smaller gold-silver mines employed hand-picking as the only concentrating process. Mill equipment was of American design or, in some cases, of American manufacture.

Efficiency: Although of doubtful accuracy because of poor sampling practice and the lack of appreciation by management of importance of maintaining

mill records, the reported average recovery (1930 to 1945) in cyanide plants of 90.36 pct for gold and 75.-58 pct for silver is of interest. Metal recoveries in flotation plants were variable, depending upon the type of ore being processed. Copper recovery (1930 to 1945) is reported to have been as high as 92 pct. A low of 65 pct recovery was reported for a complex copper ore containing a large amount of clay. Lead recovery varied between 65 and 90 pct. During World War II, the scarcity of reagents and overloading of mills resulted in a lowering of recovery.

Costs: Costs in Japanese mills did not vary widely from those experienced by American mill operators, with a crushing and grinding cost of about 50 pct of the total, and flotation and hand-picking, 30 to 40 pct. Japanese tailings disposal expenses were high, about 6 to 7 pct of the total. Between 1930 and 1945, labor in Japanese flotation plants averaged about 15 pct of overall costs. Materials cost operators 50 pct, and power 18 to 20 pct of the total. A slightly different pattern was found in the cyanide plants where labor costs amounted to 25 pct, materials about 33 pct, and power about 15 pct of operating costs.

The sale of ores and concentrates to smelters was governed by the same general conditions that existed in the United States and elsewhere. Slightly less attention was given to penalties or other charges than has been the practice in the United States smelters, but this is in accord with the general lack of close control. Also, minor items of cost were of less concern to management.

Labor

Causes of differences between American and Japanese mining are to be found in the social organization, the educational system, and economic conditions that exist in Japan. The Japanese metal mine worker usually is a native of the area in which the mine is located. If a mine is abandoned, the workers remain in the area, turning to full-time farming for support. In the older mines, as many as three or four generations of the same family may have been employed in the mine.

An unsatisfactory ratio between the number of underground and surface workers in Japanese mines always has been reflected in excessive office staffs. By 1945 only from 30 to 40 pct of the total labor force was employed underground. This was not caused entirely by a shift from underground to surface but in part by an increase in one segment of the labor group. A sizable increase in service personnel was required with the introduction of food rationing and the expansion of welfare activities

occasioned by the departure of heads of families or wage earners for the military services.

Most Japanese mines employ many women workers, particularly in surface installations. Women commonly were employed underground for haulage and similar tasks in the 1925 to 1945 period and particularly during World War II. Korean and Chinese laborers began to be employed near the end of the 1930's. By 1944, in the Hitachi copper mine, one of the largest in Japan, 1089 workers of a total labor force of 3154 were Koreans. Prisoners of war were used in many of the larger mines during the latter part of the war.

The wage structure followed the usual Japanese wage pattern. The worker received a basic wage plus a number of bonuses and allowances. Attendance allowance, efficiency allowance, high price allowance, family allowance and underground work allowance are a few. Special allowances were expected for marriage, the birth of a child, and deaths in the family, and at the end of the year. In addition to the wages, the Japanese mine worker received benefits from the company in the form of low prices for many items of food and clothing.

Between 1925 and 1945 surface workers received only 60 to 80 pct of the wage of the underground workers. Women workers in four representative Japanese mines received an average wage only 37 pct of the wage received by the male workers who, in many cases, were doing the same or lighter work.

Unions were organized, but rigidly controlled by the companies; they were largely organizations permitting a more convenient hold over the mine population.

On the other hand the paternalistic pattern of all Japanese industry was found in mining as well. The operator was expected to assume responsibility for support of the families in case of injury to workers. Formal agreements were not normally established, nor were compensation payments standardized although compensation laws existed. Pay deductions for welfare or compensation were rarely made. Under such a system, as mentioned above, compensation to an injured worker often took the form of continued support to the family, or in a case of permanently incapacitating injuries, light work in the office was often provided. When mine operations were suspended for a period, the operators continued to support most of the workers and families.

Government and Mining

Prior to the mid 30's the Japanese mining industry was relatively free from government interference, but as requirements for minerals increased, controls began to be introduced. By 1938, most of the mineral and metal prices, as well as the supply of metals, were controlled. Every phase of the industry was supervised by the Ministry of Commerce and Industry† through the Mining Bureau. Authority for such supervision was present in the Mineral Industry Law, the basic mining law of Japan, as well as in emergency legislation. A number of semi-governmental organizations established during and after 1938 permitted the government even greater control by allowing it to enter directly into operations. It was through these groups also that much financial support was provided to the mining industry.

Control Organizations: The most important of the

† Now Ministry of International Trade and Industry.

Table I. Maximum Output of Major Producing Mines in Japan, 1925 to 1945

Type of Mine	Year	Maximum Crude Ore Output, Metric Tons
Iron ore	1944	1,147,000
Copper	1942	1,007,000
Lead-zinc ^b	1943	983,000
Copper	1944	893,000
Copper	1942	839,000
Gold	1942	740,000
Copper	1943	696,000
Gold-copper	1942	656,000
Pyrite	1938	609,000
Gold-copper	1942	506,000

^a Source: company records.

^b Two adjacent mines under same management.

semigovernmental organizations in relation to the nonferrous mining industry was the Imperial Mining Development Co. Ltd., organized in April 1939. The Japanese Government held 50 pct of the stock of the company. Imperial was authorized to enter into any activity related to mining, including exploration, mine operation, granting of loans, and even operation of such auxiliary facilities as aerial tramway manufacturing concerns. The Japanese Government was to provide funds where necessary to guarantee a 4 pct profit to shareholders during the first 5 years of operations and 6 pct thereafter.

A second organization that worked closely with the Mining Bureau was the Metal Mining Control Assn., established in 1941, with a membership made up of nonferrous mining companies. It was formed to work out the solution of production problems and was an outgrowth of four control associations, the Copper, Lead-Zinc, Tin, and Mercury Control Associations which had functioned since March 1938. A Metal Distribution Co. which operated in conjunction with the Metal Mine Control Assn., was the distributing agency for nonferrous metals.

Government control in the ferrous field was provided by the Iron and Steel Assn., and by such groups as the Imperial Manganese Co. (later the Imperial Manganese and Chromite Co.) with functions similar to those of the Imperial Mining Development Co. and the Metal Mining Control Assn. Tungsten, molybdenum, pyrite, and gypsum were brought under control in 1943 when the Imperial Manganese and Chromite Co. was redesignated the Ore Distribution Control Co.

Financial Support: An intensive program of monetary support was started in 1938, partly to stimulate production and partly in apparent recognition of the lower grade ore, smaller reserves, and rising costs. The subsidy program also permitted the government to maintain control over domestic price levels by covering operating losses through subsidies rather than through price raises. The effect of the strict control over prices of metals, in spite of increasing costs, is illustrated by small rise in the official copper price between 1938, when it was Y1,050 per ton, and 1945 when it had risen to Y2,060 a ton. This is in marked contrast to the situation after 1945 when the price of copper rose from the 1945 price of Y2,060 to Y181,060 a ton in 1948.

The subsidy program gave direct financial support to the mines covering up to 50 pct of exploration and mill construction costs. In addition, subsidies were provided on gold and other metals. With the yen price of gold at Y3.85 per g, production bonuses from Y0.80 to Y3.30 per g were paid. Similar bonus plans were started in 1943 covering other metals. The amount of money paid to a mine had little or no relation to metal output. In 1943 one marginal property received Y1,279,809 in metal price bonus funds for a production of 624 metric tons of copper in concentrates; during the same year, a second mine received Y1,327,788 while producing 8343 tons.

Funds also were provided to the industry in the form of loans to the mining companies from the semigovernmental organizations, such as the Imperial Mining Development Co. Between 1939 and 1945, during a time that the yen-dollar exchange was about \$0.25 to Y1.00, about Y333,000,000 in loans were made to the mining industry; most of this has not been repaid. Large amounts of money

Table II. Mine Production by Company, In Pct of Total Output 1948 Calendar Year^a

Firm	Copper	Lead	Zinc	Pyrite
Mitsui Mining Co.		41	64	
Mitsubishi Mining Co.	28	36	20	5
Nippon Mining Co.	27			10
Seika Mining Co.	8			5
Nippon Zinc Mining Co.		5	5	
Furukawa Mining Co.	13			3
Dowa Mining Co.	8			34
Matsuo Mining Co.				29
Other	16	18	11	14
Total production, ^b metric tons	26,000	6880	33,640	1,138,100

^a Source: company records.

^b Metal content of concentrates except for pyrite which is expressed as concentrate.

were made available to metal mining through the purchase by the Imperial Mining Development Co. of gold properties after suspension of gold mining in 1943. More than Y230,000,000 was paid for the mines although only Y4,000,000 was made available as cash. The remaining funds were deposited in blocked accounts. The blocked funds could be utilized by the mine owners for the payment of taxes and other government obligations or for the support of the operation of lead-zinc or copper mines. This effectively drained the blocked accounts. Many of the mining rights so acquired are still held by the government.

The total amount of financial assistance made available to the nonferrous mining industry through 1939 to 1945 cannot be determined accurately, because of loss of records and confusion in respect to financial transactions. Available data on a sizeable segment of the industry indicate that at least Y800,000,000 were introduced as new capital, and it may be that half again as much was furnished to the industry. The importance of such financing cannot be discounted. Records of one copper mine show that 50 pct of the gross income of the mine was derived from the Government in 1943.

During 1945, mine output dropped sharply, with almost complete suspension of operations after the end of the war. Most of the gold mines failed to reopen, with only 14 of the 40 largest being in operation in 1946 and only 18 in 1947, falling off to 16 in 1948. Nonferrous metal mines, for the most part, resumed operations, with 26 of the 32 largest in operation in 1946; 27 in 1947, and 26 in 1948. Small mines began operations also, but the number was greatly reduced; by December 1948, only 159 copper mines reported production, and 177 in 1949 in contrast with over 300 during 1935 to 1940. Very few of Japan's iron mines were able to reopen because of the low grade of ore reserves.

In spite of slow initial recovery caused by financial difficulties, labor problems, shortages of supplies, and uncertainty within management circles brought about by the threat of deconcentration, by the end of 1949 substantial recovery had been made. Production of most metal was rising and plant expansion was being undertaken. Although some setback was experienced with the removal of price controls and elimination of government loans, rising metal prices and increasing demand for metals of all kinds beginning in the spring of 1950 gave added impetus to the recovery movement.

At present most metal mining companies show a clear profit from their operations, and mines which have not operated since 1944 and 1945 are being reopened. Competition for ore supplies is growing,

with some companies constructing new mills or adding to old ones for the primary purpose of treating custom ore.

The worldwide scarcity of metals and strong competition in world markets for ores and concentrates make it probable that Japan's industrial machine will find it necessary to depend in large part upon the domestic mining industry for basic raw material supplies. For this reason, in spite of low grade ore and small deposits, Japan's metal mining industry should enjoy profitable conditions as long as rearmament programs continue to occupy their present important position.

Equipment and Supplies

With a fuel shortage during 1946 and 1947 curtailing industrial recovery, machinery and equipment were difficult to get and expensive. Fuel, lubricants, steel pipe, air and water hose, electric wire, steel plate, and conveyor belts were in short supply.

The 16 pct of all mine equipment deadlined on Jan. 31, 1947, for lack of spare parts and material, was one effect of the shortage.† Other equipment was being run at reduced levels to avoid the frequent breakdowns resulting from capacity usage. Operators reported that at least 70 pct of all equipment was at least 5 years old. Coupled with the shortages was the poor quality of much of the material available; as an example, wire rope was being worn out in from 6 to 9 months.

The shortage of supplies continued through 1947. The nonferrous metallurgical industry reported that the items found to be short in the mining industry in 1946 were still out of stock at the end of 1947.§

By 1949 coal production had increased to a point where most industries were receiving reasonably adequate supplies. Equipment and materials became available in ever increasing quantities with the result that long delayed rehabilitation and development work could be undertaken. In addition to the normal replacement of worn machinery, some properties undertook large scale changeovers in mining methods. The use of scrapers was started at several mines; new drilling methods were instituted as new and better drills became available. A completely new underground ore-handling system and crushing plant were installed at the Yanahara pyrite mine, Okayama Prefecture, the second largest in the country. New mills were built and the flowsheets of old mills revised to include heavy media or other newly developed equipment. Although by July 1, 1951, some effect of the Korean affair was noticeable in the availability of equipment, in large measure little difficulty was being experienced by mine operators in purchasing new machinery.

Unions and Labor Supply

Coupled with high prices, shortages, and high costs, labor difficulties contributed to the slow recovery of the mining industry. Metal mine unions have not been as troublesome as coal mine unions, but as might be expected, with the introduction of the new concept of labor unions free from control by management, confusion arose with respect to the rights of management and unions. At first union

† Michael B. Nicholson: Natural Resources Section Preliminary Study No. 14, Machinery Distribution in the Japanese Mining Industry (July 19, 1947).

§ Michael B. Nicholson: Materials and Power used in the Japanese Nonferrous Smelting and Refining Industry, Natural Resources Section Preliminary Study No. 32 (March 26, 1949).

officials received full-time pay from the mining companies, although they spent all their time on union activities. Management personnel were forced to spend many hours, which could have been spent to greater advantage in supervision operations, negotiating over union complaints, most of which were minor and many of which had to do with activities properly the concern of management. Labor supply is adequate for current needs.

Unions: Most of the workers and unions belong to the All Japan Federation of Metal Mine Workers, organized in May 1947 with 126 member unions and 70,000 members. It had a claimed membership of 83,000 in December 1948. Leftwing influence has been strong but not dominant. Following early efforts to achieve industry-wide action, which failed to materialize, on wages and working conditions, recent union bargaining has been limited to discussions and several work stoppages which rarely spread beyond unions within a single company. Strikes affecting the entire industry have been held, but these also were merely more or less simultaneous action by single mines, in some cases apparently for the sole purpose of saving face by not being left out of the strike action.

Labor Supply and Distribution: At the end of 1950 the Japanese Mining Bureau reported that 86,633 workers of all classes were employed by the metal mining, smelting and refining industry, not including the iron and steel plants. In 1949, 80,498 were employed; of these, 37,100 were classed as surface workers. From this it appears that the same general distribution of labor still is in effect as that found at the end of World War II. Slow improvement has been made, but during the month of September 1947, a large (for Japan) copper mine reported an underground force of 803 (34.6 pct) of a total labor force of 2321, not including staff technicians, while producing 12,000 tons of ore. Elimination of loans has forced the removal or shift of some surplus labor, although this is against Japanese traditional practice. The same copper mine cited above had 2420 employees classed labor as differentiated from staff in 1949, with 1042 underground (43.0 pct), with an average monthly output of 27,700 tons of ore.

Deconcentration

Another delaying factor in the recovery was the threat of reorganization hanging over most of the mining companies. The original policy established for the Supreme Commander for the Allied Powers to follow in dealing with the companies was to require major deconcentration and reorganization. With a clearer understanding of the limitations of

Table III. Nonferrous Metallurgical Plant Capacities by Company, In Pct of Total Capacity, 1948 Calendar Year^a

Firm	Copper		Lead		Zinc	
	Smelter	Refinery	Smelter	Refinery	Electrolytic	Retort
Mitsui Mining Co.	5.0	7.3	29.0	37.0	51.0	100.0
Mitsubishi Mining Co.	20.6	18.6	34.0	21.0	30.0	
Nippon Mining Co.	30.8	20.8		31.0		
Nippon Soda Mining Co.			28.0	10.0	18.0	
Chugai Mining Co.			9.0	1.0		
Toho Zinc Co.		0.8				1.0
Furukawa Mining Co.	10.7					
Dowa Mining Co.	9.2	8.3				
Seika Mining Co.	19.7	22.8				
Dai Nippon Mining Co.	4.0					
Furukawa Electric Co.		21.4				
Total production, metric tons	120,940	115,560	21,100	42,725	29,620	26,000

^a Source: company records.

Table IV. Subsidies and Loans to Metal Mining Industry

Japanese Fiscal Year ^a	Subsidies				Government Loans		Counterpart Aid Funds ^g
	Gold Exploration ^b	Copper or Other Exploration ^c	Pyrite Price Adjustment ^d	Copper, Lead, Zinc Price Adjustment ^e	Equipment and Housing ^f	Operating Funds ^h	
1946 ^a	2,000,000	None	66,038,000	None	19,000,000	345,179,000	None
1947	4,200,000	None	None	801,414,000	374,001,000	796,421,000	None
1948	14,616,000	None	None	2,675,712,000	881,847,000	522,475,000	None
1949	14,440,000	59,337,200	None	None	None	None	308,000,000
1950	ND ^j	151,769,180 ^k	None	None	None	None	80,000,000

^a Source: Gold subsidy and loan data from Mining Bureau, Japanese Government and Mining Industry Association; price adjustment subsidy data from Bank of Japan.

^b April of named year through March of following year.

^c One half the cost of exploration (underground).

^d Difference between consumers price and pool of average cost of three or more mines producing same mineral plus dealer's price and Kodan (Public Distribution Corp.) charge is paid as subsidy to the mining company.

^e Includes a small amount for nonmetal mines.

^f Includes funds for mining, milling, smelting, and refining.

^g Matching yen fund based on amount of dollar support to Japan.

^h July 1946 to March 1947.

ⁱ Includes some funds estimated on basis of budgeted items.

^j Included with copper exploration.

^k Includes gold subsidy of about ¥14,000,000.

the industry, however, came relaxation of the original policy. Control of the mining industry actually had been fairly well balanced. The situation at the end of 1948, shown in Tables II and III, illustrates this point.

When the reorganization of the mining companies was finally directed on August 30, 1949, only Mitsui, Seika (Sumitomo), and Mitsubishi mining companies were affected. Even then the relatively good balance between the companies was recognized, so that these companies were required only to split into two companies, a coal, and a metal mining and metallurgical company. The separation of the coal and metal mining activities of the companies involved is logical because the coal mines are in no sense captive mines—the companies use but a minor part of the coal produced in their own metallurgical plants. In fact, Mitsui controlled about 16 pct, Mitsubishi 11 pct, and Seika about 4 pct of the national coal output for 1948. The break-up ordered should have no detrimental effect on the industry, and in the case of at least one concern improvement in operations has resulted.

Finances

General: With severe postwar inflation, which can be measured by the price of copper, which rose, as stated earlier, from a 1945 price of ¥2,060 to ¥181,060 a ton by 1948, rehabilitation and reconstruction work was slow in starting. Mine operators were reluctant to expend inflated yen. Reconstruction of several mills was delayed or suspended entirely, pending return to more or less normal conditions. In other instances, in mines formerly having large mills, the capacity of new plants was sharply curtailed: instead of a 6000 ton per month plant, burned in 1945, a copper mine has installed a 2500 ton per month plant. A gold-silver mine formerly having a 3000 ton per day mill capacity constructed a mill of 400 ton capacity.

Operating costs generally rose more rapidly than the controlled metal prices. Some of this difficulty was due to the fact that, while the mines found it necessary to obtain many items of supply through illegal and expensive channels, the cost of production on which metal prices were based was calculated by the pricing agency on the basis of official controlled prices of materials.

To provide funds for the mining industry to use in rebuilding and for meeting operating expenses,

and in the absence of sufficient private capital, the Japanese Government took over the task of financing by subsidies and loans. During the same period every effort was made to hold metal prices down through both price and distribution controls.

Subsidies and Loans: Initially the primary needs of the industry were funds to pay operating expenses and meet payrolls. Thus in 1946, ¥345,179,000 in loans were provided, largely from the Reconstruction Finance Bank of the Japanese Government, to be used to defray operating costs. A small amount was made available for housing and equipment. The sum of ¥66,038,000 was paid to pyrite producers as a price adjustment subsidy to cover production costs, which were higher than the selling price.

By 1947 rehabilitation programs were developing rapidly and with them came the demand for funds in greater amounts. During this year loans of ¥374,001,000 were provided for housing construction and equipment purchase and more than ¥796,400,000 for operating expenses. Price adjustment subsidies were furnished copper, lead and zinc producers in the amount of ¥801,000,000.

Government financing reached a peak in 1948 when more than ¥4,000,000,000 in loans and subsidies were paid to mining companies. Action taken by the Supreme Commander for the Allied Powers ended most government loans to the mining industry in the fall of 1949. More money was allocated to exploration subsidies, however. The Nippon Mining Co. was granted loans from United States Aid Counterpart Funds for sulphuric acid plant construction at two smelters to utilize waste gases. The detailed breakdown of loans and subsidies provided to Japanese metal mining from 1946 to 1951 is given in Table IV. It should be remembered that the yen exchange rate has changed several times, so the subsidies and loans are not as formidable as they appear to be at first glance. From a pre-Surrender ¥4.00:\$1.00, the exchange rate has risen until the rate on April 23, 1949 was ¥360.00:\$1.00 at which point it has remained through July 1, 1951.

Although metal mining received considerable assistance, the coal mining industry was in a far more favored position than the metal during the postwar period, with subsidies and loans amounting to ¥2,100,000,000 in 1946; ¥19,300,000,000 in 1947, and ¥33,300,000,000 in 1948, as compared to funds received by nonfuel mining industry of ¥432,217,000

in 1946; Y1,976,036,000 in 1947, and Y4,064,650,000 in 1948.

It should be noted that Japan's Government organization with respect to mining provides little in the way of the indirect assistance available in the United States. The Japanese Mining Bureau operates under the Resources Agency of the Ministry of International Trade and Industry and is almost exclusively an administrative organization. In 1948 the entire research budget amounted to only Y5,983,000 of the Mining Bureau's budget of Y850,000,000. Completely divorced from the other agencies concerned with underground resources is the Geological Survey under the Agency of Industrial Technology, Ministry of International Trade and Industry. The Survey has begun to provide some assistance to mine operators needing geologic advice or assistance. Peculiarities of the government mining organizations are that short time officials remain in any one position and the fact that the administrative officials do not remain in the same or related fields of activity. On August 1, 1951 the Chief of the Japanese Mining Bureau was transferred, after serving for 26 months, to the position of Chief, International Trade and Sundries Bureau (pulp, rubber goods, toys, etc.). On the same date the Chief, Mine Safety Bureau, was transferred after serving 5 months, to head the Iron and Steel Bureau (iron and steel production).

Controls and Prices: Although price controls were maintained after the end of World War II and price raises were made subject to the approval of the Occupation agencies, the general inflation brought about rapid price increases. The case of copper has been cited. Lead prices rose from Y1,800 a ton in 1945 to Y80,810 in 1948, zinc from Y2400 to Y58,036, pyrite from Y20.16 to Y2000 and iron ore from Y50 to Y1,154. By 1948 however, with increasing industrial production inflation had been brought to a virtual standstill, metal prices remained at the 1948 level through March 1949 and into 1950.

In conjunction with a general move to free the economy from unnecessary restrictions and governmental direction, many commodities which had been under both price and distribution control were released during September to October 1949. Among those released were copper, lead, zinc, and mercury; iron ore and pyrite controls were retained. As a result of the decontrol, the mining industry for the first time since 1938 was operating under relatively free economy.

Metal prices subsequent to decontrol reflected the production and stock situation rather well. Copper

Table V. Japanese Metal Prices and Price Decontrol Data, Yen Per Metric Tons^a

Metal or Ore	July Metal Price, Yen Per Metric Ton			Decontrol Data and Price Prevailing
	1949	1950	1951	
Copper	181,000	170,000	300,000	Oct. 1, '49, @ Y181,060 ^e
Iron Ore ^b	1,298	1,298	2,600	Mar. 31, '51, @ Y1,800
Lead	80,810	83,000	240,000	Sept. 2, '49, @ Y80,810
Mercury	32,000 ^d	20,000 ^d	78,000 ^d	Sept. 2, '49, @ Y32,000 ^d
Pyrite ^c	1,634	2,064	3,230	Mar. 25, '51, @ Y2,585
Tin	520,000	570,000	1,500,000	Dec. 4, '48, @ Y99,000
Zinc	58,030	116,000	250,000	Sept. 2, '49, @ Y58,030

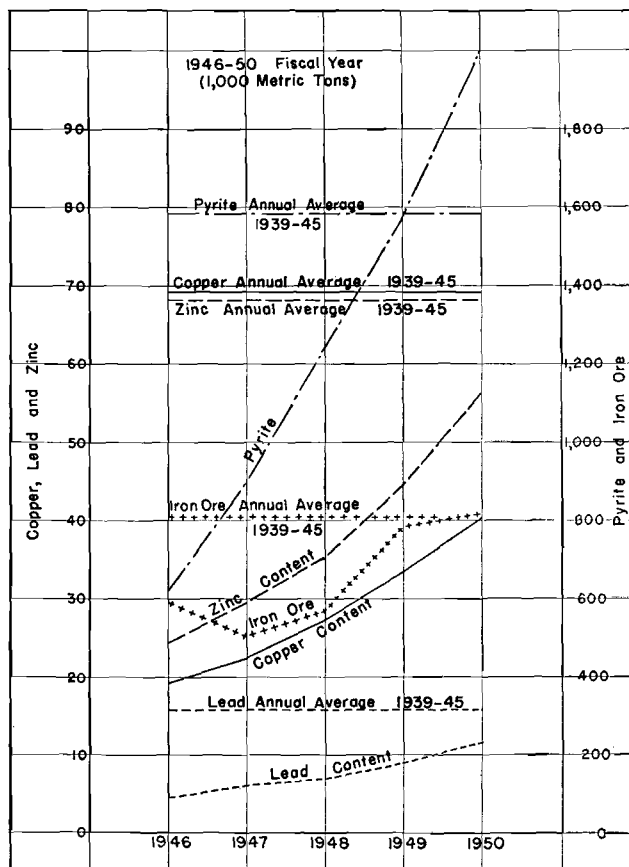
^a Source: Japan Mining Industry Association.

^b 50 pct Fe.

^c 50 pct S.

^d Price per 34.5 kg.

^e Consumers price Y102,014.



Source: Ministry of International Trade and Industry

Fig. 1—Mine production, copper, lead, zinc, pyrite, and iron ore.

prices broke from Y181,060 because of large stocks derived from the smelting of scrap and curtailed spending by the Japanese National Railway, the largest copper consumer. Several large lots of copper were exported at prices well below world market in an effort to free capital tied up in copper. Mercury prices dropped as well, reflecting small demand and relatively large stocks. The demand for zinc remained strong through 1949 and 1950, resulting in a doubling in price. At the end of March 1951 pyrite and iron ore were decontrolled, and the prices of these items started a slow rise.

With the advent of the Korean war, metal stocks largely disappeared and metal prices moved upward rapidly. To illustrate the recent metal price history in Japan, metal prices and decontrol data are supplied in Table V. As commodity prices in general increased less rapidly, the mines are now enjoying a prosperous period.

Production

As measured by the increase in the output of mine products, the recovery of the Japanese metal mining industry since 1945 has been generally satisfactory. Metallurgical plant output, drawing on large scrap stocks and imported raw materials, has been nearly equal to demand and in some cases, prior to the outbreak of the Korean fighting in 1950, exportable surplus such as copper, lead and iron ore, being limited by pluses developed. Mine production of some metals such as copper, lead and iron ore, being limited by small reserves, has been less than demand.

Pyrite mining has made the most rapid recovery because of adequate ore reserves to support output and the demands of the fertilizer industry for more

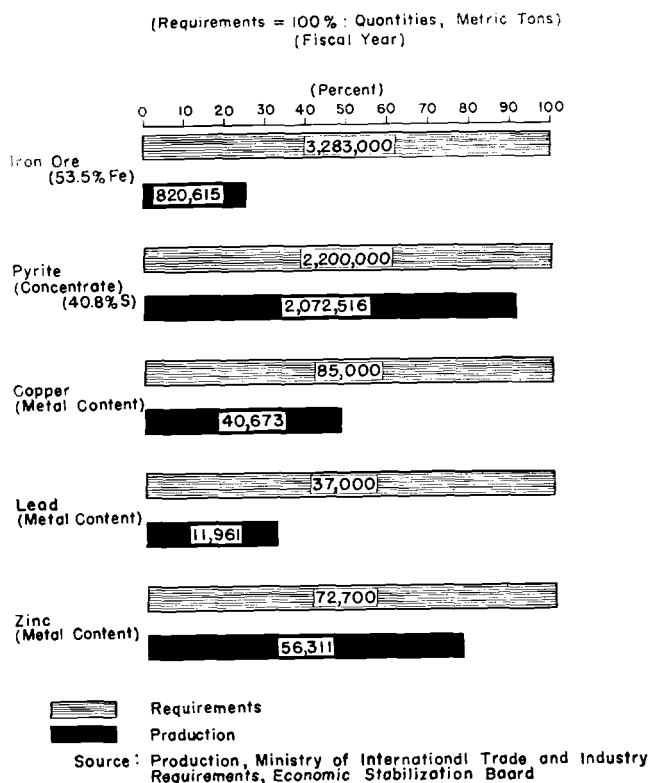


Fig. 2—Mineral and metal requirements 1951 compared with production 1950.

sulphuric acid. Fertilizer, one of Japan's most critical needs, has received particular attention from all agencies. Contributing industries, such as pyrite mining, have also come under the program. Most of the funds for equipment and housing, listed in Table IV, have been for pyrite mines or mines producing byproduct pyrite.

Mine Output: Between 1945 and 1950, mine production of major ferrous and nonferrous metals rose sharply; however production was far below the average for the 1939 to 1945 period, generally the period of maximum output. Pyrite production is the exception—having gone well above the 1939 to 1945 average. In Fig. 1 is charted the record of mine production 1946 to 1950.

Metallurgical plant output for 1950, when compared with mine production figures, illustrates the role of scrap and imported ores and concentrates in providing Japan with an adequate supply of metal, see Table VI. Since scrap stocks have been in large measure eliminated, Japanese metallurgical plant operators are entering the world market in the search for concentrates.

Table VI. Production of Metal in Concentrates Compared with Refined Metal Output, 1950,^a Metric Tons^b

Form	Copper	Lead	Zinc	Iron
Refined metal	89,690	17,211	52,481 ^c	1,935,500 ^c
Metal in concentrates	40,673	11,961	56,311	434,926
Total from scrap or imported concentrates and ore	49,017	5,250	6,170 ^d	1,500,774

^a Japanese Fiscal Year.

^b Source: Ministry of International Trade and Industry.

^c Electrolytic, 35,147; distilled, 17,334.

^d Surplus.

^e Pig iron.

Adequacy of Supply: In Fig. 2 a comparison is made between the output of the metal mines for 1950 and the estimated requirements for 1951 to indicate something of the degree to which the needs of the country are being met. Unquestionably pyrite requirements can be supplied, and an increase in zinc production of over 20 pct is possible in view of the strenuous efforts being made to add to plant capacity. With scrap and imported ores, copper needs possibly may be met without imports of refined metal, but lead metal imports unquestionably will be needed as will imports of iron ore.

Japan's metal mining industry undoubtedly will continue to play an important role in her economy. However, the part played by any given segment will be controlled by the ore reserve situation. Japan has reserves sufficient to support production of pyrite for her own needs and perhaps for export, and with added exploration and development, zinc probably can join pyrite. At high cost, most of Japan's copper needs can be satisfied but lead and particularly iron ore are limited in amount. Nonmetallics used in the processing of metal ores, such as limestone and refractory silica and clays except special-purpose high-aluminous clays, are plentiful. Graphite and manganese, although not high grade, are relatively plentiful but not adequate to meet demand. High grade chrome is available in limited amounts, as is refractory chrome. One encouraging feature in the reserve picture is the tremendous improvement in the quantity and quality of geologic exploration work by the mining companies. Little tungsten is available. An important shortage, particularly from the standpoint of the iron and steel industry, is that of suitable coking coal. Although good metallurgical coke can be made from Japanese coals in adequate quantity by proper blending and by use of additives of various types, the use of such coke poses economic and operating problems which are of sufficient magnitude that coking coal will be imported if available, even at high cost.

Occupation Headquarters

After the surrender of Japan, technological assistance to the Japanese metal mining industry was provided by the Mining and Geology Div., Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, General MacArthur's Headquarters in Tokyo. The Division organization roughly paralleled that of the U. S. Bureau of Mines, with a Minerals Branch, Metallurgy Branch, Solid Fuels Branch, Petroleum Branch, and a Minerals Economics Branch. In addition to the technical assistance program carried on by the Division, studies were made of the various mineral commodities to provide background information for planning. A series of reports covering the results of the studies have been issued. Through July 1951, 75 reports and supplements and 21 preliminary studies, covering the reserves, mining, and milling of ore petroleum reserves and production, and metallurgy were published. In addition, five special studies have been made covering machinery distribution, administration of the mining industry or mining methods. The reports are available in photostat or microfilm from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The issuing agency should be cited as Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers.