Iron and Steel

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For the United States iron and steel industry, 1967 was a year of lowered demand, production, and shipments for both pig iron and steel. Raw steel production reached 127.2 million tons, 6.9 million tons below the record 1966 figure; shipments totaled 84 million tons compared with 90 million in 1966. Lagging shipments to the automobile industry and the steel haulers' strike affected domestic shipments, along with inroads made by foreign producers.

In the face of increasing competition from abroad, steel companies made impressive progress in their efforts to improve technology and increase efficiency. Basic oxygen steel production increased 22 percent, electric furnace production was higher, and planned capacity for continuous casting gave promise of higher production yields in the near future.

Table 1.—Salient iron and steel statistics

(Thousand short tons)

	1963	1964	1965	1966	1967
United States:					
Pig iron:					
Production	71,840	85,458	88,207	91,287	86,799
Shipments	72,211	85,693	88,391	90,884	86,819
Exports	70	176	28	12	7
Imports for consumption	645	736	882	1,187	605
Steel:[1]					
Production of ingots and castings (all grades):					
Carbon	98,714	114,442	116,651	118,732	113,190
Stainless	1,204	1,443	1,493	1,651	1,451
All other alloy	9,343	11,191	13,318	13,718	12,572
Total	109,261	127,076	131,462	134,101	127,213
Index (1957–61) = 100	111.8	130.0	134.5	137.2	130.1
Total shipments of steel mill products	75,555	84,945	92,666	89,995	83,897
Exports of major iron and steel products	2,670	4,065	2,888	2,144	2,079
Imports of major iron and steel products [2]	5,637	6,630	10,640	11,043	11,446
World production:					
Pig iron [3]	310,000	350,000	369,000	382,000	391,000
Steel ingots and castings	427,000	483,000	506,000	525,000	543,000

NA Not available.
[1] American Iron and Steel Institute.
[2] Data not comparable for all years.
[3] Includes ferroalloys.

Trends and Developments.—The domestic steel industry spent $2.4 billion for capital improvements in 1967, a 10 percent increase over that of 1966. The outlook for 1968 is for an even larger expenditure. Capital expenditures for new plants and facilities have totaled about $14 billion during the last 10 years and are estimated at $9 billion for the next 4 years.

Emphasis of modernization programs was placed on rolling and finishing facilities, and on a more diversified product spectrum. The finishing side of the steel mill, and new products such as steel foil, weathering steels, and tinfree steels are critical areas in the domestic industry and are given priority in order to meet the

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increasing demand for better quality steels and to meet the challenge of alternate materials. The construction and modernization of primary production facilities proceeded throughout the industry, primarily to meet the need for greater efficiency.

United States Steel Corp. spent $575 million in 1967 (up 30 percent over that for 1966) for replacement, modernization, and extension of facilities. New authorizations during 1967 totaled $775 million. At the end of the year the amount required to complete all authorized projects was $1,150 million, an alltime high level. Nearing completion at the South Works, Chicago, Ill., were three basic oxygen furnaces and a 32-foot hearth blast furnace. A large continuous slab casting unit began its break-in at Gary, Ind., in conjunction with the startup of a computer-controlled 84-inch hot strip mill, a 52-inch cold reduction mill, and a high-speed tinning line. U.S. Steel moved ahead with construction of its plate mill complex at Baytown, Tex., as well as the cold-rolling facilities at Irvin, Tex., and the four strand unit for continuous casting of blooms and billets at Torrence, Calif. Improvements were also affected at plants in Lorain, Ohio, Joliet, Ill., and Fairless Hills, Pa. A major program was announced to increase the silicon sheet steel production by 30 percent at the Vandergrift, Pa., plant. At yearend, U.S. Steel announced plans to phase out its production of cold finished bar products at Newburgh, Ohio, by mid-1968.

Bethlehem Steel Corp. announced details of Phase II plans for its 5-year expansion project at Burns Harbor, Ind. Initial output of 1.5 million tons will be provided by two 250-ton oxygen converters drawing hot metal from a 35-foot hearth blast furnace—largest in the U.S. industry. Ultimate capacity of the plant will be 5 million tons a year. Phase I was the initial building program by which Bethlehem made its debut as a Midwest steel producer. Completion of Phase II in 1970 will mark Bethlehem expanding to become a fully integrated steel producer at Burns Harbor, complete with hot metal facilities and a harbor through which raw materials can be furnished. Estimated cost of Phase I and II is $900 million. Total capital expenditures in 1967 were $353 million. Expansion programs proceeded at all other major plants including rolling and finishing facilities at Sparrows Point, Md., Bethlehem, Pa., and Lackawanna, N.Y. Bethlehem announced at midyear it had ordered its first production continuous casting machine, which will be installed at the Johnstown, Pa., plant. Additionally, two basic oxygen furnaces, to be installed at the Bethlehem Pa., plant, will bring to a total of seven such furnaces operated by the firm.

Capital expenditures for Republic Steel Corp. totaled $162 million in 1967, the largest part of which was allocated to its Cleveland, Ohio, works for installation of a 84-inch hot strip mill and related cold mill facilities, for blast furnace rebuilding, for a water pollution abatement program, and for other improvements. Construction at the Canton, Ohio, plant of four 200-ton electric furnaces, two continuous casting units, and new vacuum melting and vacuum degassing facilities will double Republic's capacity to produce high-strength alloy steel. Other improvements underway during the year included blast furnace relines at Buffalo, N.Y., and Gadsden, Ala.; billet and skelp mill modernization at Youngstown, Ohio; rebuilding the bar mill complex at Buffalo, N.Y.; and start of construction of a 14-inch bar mill at Chicago, Ill. A new plate mill which went onstream at Gadsden, Ala., in 1967 put Republic in a good position relative to the booming southern market for plate.

Armco Steel Corporation's major project at Middleton, Ohio, which involves building a new steel mill alongside of an old one, moved toward the target completion date of mid-1968. An 80-inch hot strip mill, part of a 3,300-foot hot rolling complex, is the key facility. Raw steel production will be boosted by the installation of two 200-ton oxygen converters. Construction of electric furnaces proceeded at Butler, Pa., Kansas City, Mo., Sand Springs, Okla., and Houston, Tex. Vacuum degassing and continuous casting were being installed at Butler, Pa., and cold mill facilities were completed at Ashland, Ky., during the year.

National Steel Corp. contracted to buy 3,300 acres near Pittsburg, Calif. The firm declined to comment on plans for development of the property, which has access to the Pacific Ocean through a 50-mile-long, 30-foot-deep channel. National specializes

in the types of light, flat-rolled and coated sheets that are widely consumed in the Pacific coast market. Work continued on the electric furnace-continuous casting billet complex at National's Great Lakes Steel Div., Detroit, Mich., and planning was started for a second BOF at the plant. The firm's Weirton Steel Division, Weirton, W. Va., reported smooth operation of its new 300-ton oxygen converters and was nearing break-in on the vacuum degrassing and continuous casting units.

Youngstown Sheet & Tube Co. progressed in construction of an 84-inch hot strip mill and conversion of a blooming mill to a universal mill at its Indiana Harbor Works, East Chicago, Ind. In addition, a 32-foot hearth blast furnace was completed and two 260-ton oxygen converters were being constructed. Completion of the project will further integrate the plant toward the flat roll market.

Jones & Laughlin Steel Corp., the nation's fifth largest steelmaker, continued construction of the Chicago area's newest steel mill at Hennepin, Ill. As with other new mills, the Hennepin plant will integrate backwards starting with the finishing mills. A completed 84-inch cold rolling mill and continuous galvanizing line are supplied with semifinished steel from the Cleveland Works. Installation of oxygen converters and continuous casting at Aliquippa, Pa., and improvements at Hammond, Ind., and Cleveland, Ohio, are also part of a 3-year, $400 million, expansion program.

PRODUCTION AND SHIPMENTS OF PIG IRON

Responding to a lessened demand from the steel and foundry industries, pig iron production and shipments dropped 5 and 4.5 percent, respectively, from the record highs of 1966. Although Pennsylvania and Ohio continued to lead in pig iron production, these two States showed a decrease in production and shipments while Indiana, the Nation's third leading producer, showed a slight gain.

According to the American Iron and Steel Institute (AISI), there were 233 pig iron blast furnaces on January 1, 1968, two fewer than on the same day in 1967. Of these, 168 were in blast, an increase of 10. The average production per blast furnace day rose to 1,570 tons. This was a 5-percent increase over that of 1966 and was a significant indication of industry efforts to increase blast furnace efficiency.

Metalliferous Materials Consumed in Blast Furnaces.—The agglomerate charge consisted of 34.7 million tons of sinter, 16.7 million tons of self fluxing sinter, 36.9 million tons of pellets, 9.7 million tons of foreign agglomerates. No nodule consumption was reported.

According to AISI, blast furnace consumption of oxygen decreased from 9 billion cubic feet in 1966 to 8.7 billion in 1967. Data collected by the Bureau of Mines showed that 39.9 billion cubic feet of natural gas, 4.5 billion cubic feet of coke-oven gas, and 68.5 million gallons of oil were consumed by blast furnaces in 1967.

CONSUMPTION OF PIG IRON

Consumption of pig iron decreased 4.8 percent, almost equal to the 5.1-percent decrease in steel production. All districts in the United States showed decreases in consumption except the East South Central, which showed a slight increase. Plants in the Middle Atlantic and East North Central districts consumed about 77 percent of the total.

PRICES

Pig iron and steel prices increased slightly during 1967. The average composite pig iron price, published by Iron Age, was $56.38 per short ton, compared with $56.34 in 1966. The Iron Age figure for the composite price of finished steel was 6.496 cents per pound, compared with 6.445 cents per pound in 1966.

FOREIGN TRADE

Exports of steel products decreased 3 percent in 1967, continuing the downward trend begun in 1965. Exports of sheet and strip increased while exports of ingots and tin mill products decreased. Pig iron exports continued to drop sharply; tonnage in 1967 was 4 percent of that for 1964.

Imports of steel products increased 4 percent in 1967, establishing a record high and prompting the introduction of several import quota bills in Congress. Sheets and strip, steel plate, wire rod, and pipe led the list of products in terms of volume. Combined imports from the European Economic Community increased substantially while imports from Japan decreased; these supply sources accounted for 42 percent and 39 percent of the total, respectively. Imports of pig iron dropped 50 percent as no imports were received from Communist countries or from the Republic of South Africa.

The sixth tariff negotiating conference sponsored by the General Agreement on Tariffs and Trade (GATT), known as the "Kennedy Round," terminated on June 30, 1967, after 3 years of deliberations. The Kennedy Round will result in a five-stage reduction of U.S. steel tariffs from a weighted average of 7.44 percent in 1966 to 6.5 percent in 1972. Other major countries reduced their tariffs on steel generally by more than the United States, with the result that steel tariffs are now more closely harmonized among major countries.

WORLD REVIEW

World production of pig iron (including ferroalloys) and steel established a record in 1967, as the decrease in U.S. production was outweighed by production increases in Japan, Italy, and the U.S.S.R.

Formation during the year of the International Iron and Steel Institute offered hope that there will be greater understanding among the producing nations of the complexities and problems facing the world steel industry.

NORTH AMERICA

Canada.—Hawker Siddeley Canada Ltd. announced on October 13 that its Dominion Steel and Coal Corp. (Dosco) blast furnace and open hearth facilities at Sydney, Nova Scotia, would be closed on April 30, 1968. Reasons given for closing the 70-year-old plant were depletion of local iron ore deposits, outdated equipment, poor location relative to markets, and increasing competition resulting from excess steel capacity throughout the world. Operating losses were reported to be $4.3 million in 1966 and $6.4 million for the first half of 1967.

In December, the Nova Scotia House of Assembly approved a purchase agreement between the company and Provincial officials by which Dosco was to operate the plant as Provincial agents from January 1, 1968, until April 30, 1968. Thereafter a crown corporation will operate the plant until April 30, 1969, or until a buyer is found. Purchase price was reported to be about $23 million.

Canada's first research facility devoted to applied research in the field of iron and steel manufacturing technology was opened in June by the Steel Company of Canada Ltd. (Stelco). Research activities to be carried out at the $4 million center will be designed to develop improved steel products, to increase productivity by the development of new and improved manufacturing processes, and to utilize Stelco's waste materials by development of methods to transform them into profitable byproducts.

Dominion Foundries and Steel Ltd. (DOFASCO) put in operation in June a new $25 million automated five-stand cold reduction mill.

Canada Petrofina, a subsidiary of the Belgium Petrofina organization, announced plans to build an iron powder plant near its Montreal refinery in partnership with Consolidated Quebec Smelting and Refining.

Mexico.—Each of the four top producers in Mexico plan to double capacity by 1970; however, the country will probably remain a net importer of steel for the foreseeable future.

Hojalata y Lamina, S.A. (HyL), announced plans to construct an integrated steel plant near Pueblo which will produce

250,000 tons of steel products per year in the form of billets, bars, shapes, and wire. Plant design includes a direct reduction facility of the HyL type, three electric furnaces, two 4-strand continuous casting machines, and a continuous light-section and wire-rod mill.

Altos Hornos de Mexico, S.A., began operating its third blast furnace in November 1966, increasing the ingot capacity of the Monclova works to more than 1.5 million tons. Other elements of the expansion program include a basic oxygen steel plant, raw material crushing plants, blooming mill, coke oven plant, and a 150-ton-per-day oxygen plant—all of which will increase capacity to over 2 million tons and will broaden the company's product mix.

Cía. Fundidora de Fierro y Acero Monterrey, S.A., completed the installation of its third blast furnace and had underway the installation of a 56-inch, 4-stand, tandem cold mill. Capacity is expected to reach 1 million tons by 1969.

Tubos de Acero de Mexico, S.A., opened a HyL sponge-iron facility at its Vera Cruz plant, thus replacing most of the company's scrap needs.

SOUTH AMERICA

Argentina.—Argentina, like other Latin American steel producers, was involved in an ambitious program to boost tonnage. The Government target for raw steel products by 1972 is 4.5 million tons, a threefold increase over 1967 production.

The Government authorized Sociedad Mixta Siderúrgica Argentina (SOMISA), the State-owned steel company, to proceed with expansion plans to increase capacity from 1.2 million tons of steel ingots to 2.2 million tons by 1974. In a decree published August 22, Argentine official banks and entities were empowered to give SOMISA the guarantees for foreign borrowing required to finance the expansion. The first phase, to be in operation by 1971, will involve a new sinter plant and improvements to rolling mills. The second phase will include a basic oxygen furnace (BOF) shop and a continuous casting line and is scheduled for completion in 1972. The third phase is to be completed by 1973, and designates construction of a coking plant and second blast furnace. Cost of the entire project is estimated at $195 million.

The Argentine Government approved several modifications to the program originally approved in 1965 for the construction of a new integrated steel plant by Propulsora Siderúrgica S.A. at Ensenada. Decree 1296/67 obligates Propulsora to place the hot rolling mill in operation during 1972 and the blast furnaces and steel plant in operation during 1974. However, these dates may be advanced or delayed, depending on market demands. The first stage of the project calls for an investment of $60 million, 50 percent of which will come from equity financing and 50 percent from private interests. The equity financing will come from Italy and the remainder will be negotiated with private interests in Italy, the United Kingdom, and Japan. According to trade sources, Propulsora is guaranteed raw materials at about world prices, which when sold locally should generate profits for the financing necessary for the second and third stages.

Brazil.—Expansion plans of the Brazilian steel industry were revealed in January in a report prepared by Booz Allen & Hamilton International for the National Bank of Economic Development. It was based on the findings of a committee of Brazilian Ministers, representatives of the steel industry, and officials from the World Bank and International Monetary Fund. The report recommended that the main expansion to 7.5 million tons annually by 1972 should take place in the three large Government-controlled integrated works, Campanhia Siderúrgica Nacional (CSN), Usinas Siderúrgicas de Minas Gerais (USIMINAS), and Cia Siderúrgica Paulesta (COSIPA). It also suggested that new plants producing light-rolled products be installed at Recife and Corumba to meet regional needs. The report further recommended that annual production be raised to 9.6 million tons by 1975. The investment necessary was estimated at $603 million.

The three major steel producers, CSN, USIMINAS, and COSIPA reached an agreement in September in which they subscribed to a policy for the unification of sales, prices, and marketing methods.

Chile.—The Export-Import Bank announced in March it had authorized a $25 million Alliance for Progress loan to

Compañía de Acero del Pacífico S.A (CAP) to help expand its steel production from 650,000 tons to 1 million tons annually. The total cost will be about $130 million and will include new finishing mills, an electrolytic tinning line, two oxygen converters, an oxygen plant, and ancillary equipment. Additional financing needed will be made available from CAP's corporate resources, Chilean financial institutions, and a loan from European sources.

Colombia.—By Resolution No. 370 the Superintendency of Economic Regulation on December 26 freed semifinished and finished iron and steel products of domestic manufacture from price control. Two days after the price control removal, Acerías Paz del Rio S.A., the country's largest and only integrated steel mill, raised its prices by an average of 25 percent. The price increase will result in increased profits for 1968 and thereby improve the position of the company to receive international credits for development programs.

The first stage expansion plan of Acerías Paz del Rio is scheduled for completion in 1968 while the second stage awaited financing.

Peru.—The Peruvian Government signed a decree on September 29 approving the contract between Corporacion Peruana del Santa and the member companies of the Italian-French Consortium, CONSIDER-ENSID, for the construction of a $67 million rolling mill at the Chimbote steel plant. A new blast furnace was reported to be in operation in October at the plant and two oxygen converters and a continuous casting line were reported to be in the planning stage or under construction.

EUROPE

European Coal and Steel Community (ECSC).—Raw steel production for ECSC countries totaled 99 million tons in 1967, a 6-percent increase over that of 1966, due mainly to an 18-percent increase in exports to third countries. Exports to the United States increased 38 percent and exceeded those from Japan. Internal consumption showed no marked increase, although there were considerable variations from one ECSC country to another. In the first half of the year prices tended to stabilize; however, in the second half prices declined, as production exceeded consumption.

The ECSC forecasted a capacity of 132 million tons by 1970, due mainly to increased facilities for oxygen steelmaking. Emphasis over the next few years will be on modernization, including reorganization, replacement of obsolete plants, and, in some cases, closures. Mergers of August Thyssen-Hutte and Huttenwerk Oberhaussen in West Germany, and de Wendel, Sidelor, and Société Mosellane de Sidérurgie in France are indicative of the trend toward large production groups.

Italian steel production in 1967, 17.5 million tons, showed the largest percentage increase of any country in the Community. Despite higher production, consumption outstripped steel output and Italy remained a net importer of steel in 1967. During the year, Italy added 1 million tons of capacity and showed signs of threatening France for the second spot in the Community.

It was announced that the U.S.S.R. will build a 48-inch diameter pipeline from the Ukraine to Italy (a distance of 1,860 miles) for gas transmission; the pipeline will require about 1.7 million tons of pipe.

Italsider S.P.A ordered a second real-time computer system for its plant at Cornigliano, Italy. The new unit will be used for production control, order acceptance programing, control of shipments, inventory, raw materials, work in progress, and finished products. The first unit was installed in 1963.

Austria.—VOEST Steel Manufacturing Company began assembly in April of two oxygen converters which are to be installed at the Taiyun Works, 300 miles from Peking, mainland China, sometime in 1968. Reports of capacity range from 600,000 tons of steel to 1.5 million tons annually.

Bulgaria.—When present expansion plans are completed, Bulgaria will have an annual steelmaking capacity of 4.5 million tons and will be able to supply 65 percent of domestic demand for rolled products.

The U.S.S.R. was reported to have signed an agreement with Bulgaria to expand the capacity of the Kremikovtsi steel plant from 1 million to 1.5 million tons of rolled steel. The U.S.S.R. is to provide

technical assistance and equipment including a blast furnace, a coking plant, and an electric furnace. Other facilities under construction include a 100-ton oxygen converter, hot strip mills, a finishing mill, and a ferroalloy shop.

Czechoslovakia.—Expansion of steelworks continued in 1967 with considerable assistance from the U.S.S.R. At the East Slovakia Ironworks, Kosice, the No. 2 blast furnace was due to be blown in at yearend. The No. 2 BOF shop, which will contain two 130-ton vessels, was under construction during the year.

At Kladno, in Western Bohemia, the United Steel Works is replacing obsolete facilities with a new plant designed to produce 1 million tons of high-grade steel yearly. Major equipment will be two electric furnaces, two oxygen converters, two continuous casting installations, and a vacuum degassing plant.

Finland.—The second phase of expansion of the state-controlled steel company, Rautaruukki Oy, was officially inaugurated at the company's main plant at Raahe on October 21. New facilities include two oxygen converters, three continuous slab casting machines, and auxiliary equipment —all obtained from the U.S.S.R. The new plate mill was purchased from a British concern.

Greece.—The integrated Greek steel company, Halyvourgiki S.A., reportedly will spend $20 million to expand its production range to include coils, plates for shipbuilding, and shapes so as to fully utilize the blast furnaces. Part of the additional plant will be finished in 1968 and the rest in 1969 with initial output set at 500,000 tons.

Hungary.—Reports from Budapest indicate that a new iron foundry will be built in northern Hungary which will start production in 1972. The plant will employ 4,000 workers and will produce 110,000 tons of castings per year.

A new electric steel plant was under construction at the Diosgyor Works, with an annual capacity of 75,000 tons. A 50-ton furnace will be supplied by the U.S.S.R

Poland.—The largest continuous billet casting unit in Europe began operating at the Huta Zawierce steel plant in Kratowice province in January. The new installation, designed and constructed by Polish engineers, is the third of its type in Poland and has an annual productive capacity of 280,000 tons.

The U.S. Treasury Department published in the Federal Register on November 2, 1967, its formal finding of dumping with respect to cast iron soil pipe imported from Poland.

Sweden.—Although raw steel production stagnated in 1967, expansion of productive capacity continued at a pace to keep Sweden among the world leaders in use of modern equipment.

As a result of an expansion program announced in March, the Grängesberg Co.'s, Oxelösund iron and steel works will become one of Europe's largest producers of heavy and medium plate. The company stated it will install two additional Kaldo converters and a two-strand continuous slab casting machine, which with ancillary equipment, will raise raw steel capacity to over 1 million tons per year and plate production to 600,000 tons per year.

Grängesberg also announced it will expand its cold rolled stainless steel sheet capacity at the Nyby works from 17,000 tons per year to 40,000 tons by 1969.

The Höganäs Company, one of the world's leading producers of sponge iron and iron powder, will construct an atomization plant at Höganäs with an annual capacity of 40,000 tons of iron powder.

United Kingdom.—The second largest steel company in the free world was brought into existence with the nationalizing of the British steel industry on July 28, 1967. The new entity, the British Steel Corporation, has an ingot capacity of 30 million net tons, second only to the United States Steel Corporation. The company is made up of the 14 largest raw steel producers in Great Britain, who represent 94 percent of the steelmaking capacity. The involved companies control 145 subsidiaries as well as 47 foreign affiliates. The remaining 210 companies in the private sector are non-integrated producers of specialty steels. The nationalization cutoff point was 475,000 tons of raw steel capacity. For the purpose of operations and sales, the 14 companies were divided on a geographic basis into the following four regional divisions: Midland,

Northern, Scottish and Northwest, and South Wales.

U.S.S.R.—The Karaganda Iron and Steel Works, Kazakhstan, will install two more blast furnaces, reportedly the world's largest when put into operation. An oxygen converter shop, plate mill, and continuous sheet mill will also be constructed. The works will specialize in autobody sheets and will form the third steel center being set up in the eastern regions.

AFRICA

Algeria.—Construction of Algeria's first integrated iron and steel works was underway in 1967. The ironmaking facility will be supplied by France, the melting shop by the U.S.S.R., and a hot strip mill by two Italian companies, Innocenti and Marelli. Ironmaking is scheduled to start late in 1968, steelmaking toward the end of 1969, and rolling mill production in early 1971. Ultimate annual capacity of the strip mill is expected to be 150,000 tons of plates and 800,000 tons of sheet and light plate in coil. Pipemaking capacity will be 100,000 tons annually.

A decree published in Algiers on May 6 brought the importation of iron, steel, and other metals under national control. Société Nationale de Sidérurgie, the state-run national iron and steel company will now have a monopoly on the import of these products, which account for 5 to 10 percent of total imports in tonnage and value. With state control of imports, Algeria can make the placing of orders conditional on the exporting country taking Algerian iron ore.

ASIA

Japan.—Unlike most major steelmaking nations, who have been emphazing programs to modernize existing facilities, Japan has been emphasizing investments in new facilities to meet the booming domestic market for steel products. New blast furnaces and oxygen converters installed in 1966 and 1967 resulted in a remarkable 30-percent increase in raw steel production in 1967, and a consolidation of Japan's position as the third largest steelmaking country in the world. Expansion underway in 1967 will boost Japanese capacity past 90 million tons by 1972. With domestic consumption estimated at 72 million tons, a substantial amount will continue to be available for export.

Production expansion in 1967 involved new coastal steelmaking complexes, each with production capabilities of 8 to 10 million tons. Yawata Iron & Steel Co., Ltd., embarked on a long term program to expand its Kimitsu works and convert it to integrated production. Sumitomo Metals has under construction an integrated tidewater steel-works at Kashima, north of Tokyo.

TECHNOLOGY

The basic oxygen steelmaking process, which just 10 years ago accounted for only 1.3 million tons of steel production, produced 41.5 million tons or about one-third of the total U.S. output in 1967. It represented a 22.2-percent increase over 1966 production while total raw steel output dropped 5 percent. Capacity in the United States was estimated at 43 million tons at the end of 1967 and is expected to increase to 65 million tons by 1970.[2]

In 1967 Japan produced 65 percent of total raw steel by the basic oxygen process, West Germany 30 percent, and the U.S.S.R. 6 percent. Installed world capacity at the end of 1967 was 165 million tons. This is expected to increase to about 260 million tons by 1970.[3]

Design parameters and operating data for 11 U.S. oxygen converter vessels and 10 foreign vessels were discussed and analyzed. Heat size ranged from 130 tons to 335 tons; that is, from high-carbon, alloy, or phosphoric double-slag practice at the lower extreme to very fast operating practice for low-carbon steels at the upper extreme. Annual capacity, bath depth, freeboard, shell diameter, height, inside volume, and various ratios were plotted against heat size and lines of regression were determined for all relationships by

[2] Stone, J. K. L–D Steelmaking At Mid-1967. J. of Metals, v. 19, No. 7, July 1967, pp. 10–11, 36.

[3] Metal Bulletin (London). L–D's Inexorable Growth. No. 5240, Oct. 17, 1967, pp. 15, 18–21.
Stone, J. K. World Distribution of L–D Basic Oxygen Steel Plants. 33/The Magazine of Metals Producing, v. 5, No. 10, October 1967, pp. 116–124.

the least-squares method. From the lines of regression an optimum configuration was determined for a 200-ton-capacity basic oxygen converter.[4]

Steelmaking by the open hearth process has declined from the 1956 peak of 103 million tons (90 percent of total production) to about 70.7 million tons (55 percent of total production) in 1967. A further decline to about 50 million tons by 1969 and to 25 million tons by 1972 is predicted. Phase-out of this process, which has been the work horse of the industry for more than 20 years, is expected sometime between 1980 and 1990.

Although the open hearth as a steel producer lost ground to the basic oxygen process, it still remained the major source of this metal in 1967, and considerable effort went into raising the efficiency of the furnace. Improvements were made in charging, in intense-firing burners for decreasing time of melting, furnace refractories, continuous carbon analysis, and control of fume from the operations.

Another significant, although not spectacular, development in U.S. steelmaking has been the steady increase in electric arc melting capacity and its wide application for the production of carbon steel. In contrast to the earlier applications of the electric arc process which involved small furnaces used almost exclusively for alloy and stainless steels, furnaces, comparable in size to the BOF and the open hearth, are now available that produce large tonnages of ordinary carbon steel. At yearend there were over 200 electric arc furnaces operational in the United States, seven of which were in the 200-ton capacity class. Annual capacity was estimated at 20 million tons, which will be increased to about 30 million tons when the 45 to 50 new furnaces under construction at yearend are completed. Most industry experts expect an accelerated growth rate in the near future with electric furnace steel production about equaling BOF production in the 1990's.

With the phase-out of open hearth furnaces and the steady rise in steel consumption, electric furnace operators are assured of an adequate future scrap supply. Electric furnaces, however, are not restricted to 100 percent scrap charge. Hojalata y Lamina, S.A., (HyL) in Monterrey, Mexico, has made electric furnace steel since 1957 using substantial amounts of sponge iron. Pilot work at The Steel Company of Canada, Ltd., demonstrated the feasibility of continuously charging prereduced iron-ore pellets in amounts of from 15 to 100 percent of the electric furnace charge. Preliminary economic studies showed that the process can produce steel in quantities up to 2.5 million tons at competitive costs to that of the conventional blast furnace-basic oxygen furnace combination. Additionally, the process offers the possibility of continuous steelmaking.[5] Work at the Albany (Oreg.) Metallurgy Research Center of the Federal Bureau of Mines has shown the production of carbon steel by the continuous addition of prereduced iron ore to molten automobile scrap in an electric furnace charge appears to have certain operational advantages over conventional cold-melt, batch-charging techniques. Among these are: (1) lower tramp element content in the ingot, (2) shorter heat times and lower electrical energy consumption, (3) improved energy input rate during the continuous addition, and (4) flexibility of charge composition by varying the ratios of scrap to prereduced iron ore.

Plans for commercial development of direct iron and steel processes in the United States were noted in 1967. The Oregon Steel Division of Gilmore Steel Corp., San Francisco, Calif., announced plans to build an integrated electric steel plant at Portland, Oreg., using prereduced pellets for raw material. Metallized pellets will be obtained from an adjacent plant being constructed by the Midland-Ross Corporation, Cleveland, Ohio. McWane Cast Iron Pipe Co., Mobile, Ala., has an integrated plant under construction to convert iron ore directly to metal. A composite charge of pellets made from iron ore, coal and oystershell are carbonized and prereduced on a traveling grate for smelting in a submerged-arc electric furnace. A West German firm announced plans to construct a new plant at Georgetown, S.C., involving an electric furnace, continuous casting facilities, and a rolling mill. Raw material will be scrap, with the

[4] Stone, J. K., and E. J. Prince. Survey of Large L-D Furnace Configurations. Iron and Steel Eng., v. 44, No. 2, February 1967, pp. 65–75.

[5] Sibakin, J. G., P. H. Hookings, and G. A. Roeder. Electric Arc Steelmaking With Continuously Charged Reduced Pellets. Blast Furnace & Steel Plant, v. 55, No. 9, September 1967, pp. 816–829.

possibility of pelletized iron ore being used in the future.

The first commercial spray steelmaking plant went into operation at the Lancashire Steel Manufacturing Co. Ltd., Manchester, England. This unit has a capacity of 50 tons per hour and was installed early in the year. A second installation is presently under construction at Shelton Iron and Steel Co., Ltd., Stoke-on-Trent. This works presently has four casting machines with a total of 11 strands and the product from the spray steelmaking process will be continuously cast. Others actively interested in this process are the United Steel Co., Ltd., the Millom Hematite Ore and Iron Co. Ltd., The Broken Hill Pty. Co. Ltd., New South Wales, Australia, and at least three U.S. steelmaking companies. Millom is planning to enter the steelmaking business with a full-scale plant and has applied for approval and assistance from the Iron and Steel Board. United Steel is considering spray steelmaking installations at the Workington Iron & Steel Co. and at Appleby-Frodingham Steel Co. works at Scunthorpe. With the object of undertaking commercial exploitation, The British Iron and Steel Research Association (BISRA) has established two subsidiary organizations to supply technical assistance and negotiate licensing agreements for this process. Advantages claimed for the spray process are the small capital investment needed, relatively low labor costs, and the possibility of a continuous steelmaking system.

The growth of continuous casting capacity in the United States has been explosive. At the end of 1966 there was 800,000 tons per year of capacity installed; at the end of 1967, 1 million tons; and by the end of 1969 there will be over 13 million tons of billet blooms and slab capacity installed and operating. It is estimated that there will be 40 million tons of continuous casting capacity at the start of this process' second decade in 1972.

Most of the continuous casting units in production by yearend 1967 were steel plants with capacities of less than 200,000 tons per year. These companies accounted for 90 percent of continuous casting production in 1967 and, since the first commercial machine started up in 1962, have played a major role in pioneering and developing this casting revolution. The key reason for gambling on this innovation has been a low-cost increase in capacity, although the resulting layout compactness has been important for companies with limited space. Additionally, continuous casting has made it easy for a small steelmaker to make high-quality products and to upgrade the product mix.

In 1968, several large slab casters will join the numerous high-capacity billet casters put onstream in 1967 and will push annual capacity to 3.5 million tons by yearend. With these new machines larger steel companies will become the major factors in future continuous casting production and technology development.

Although continuous casting has been adopted for a variety of steels, some problems remain:

1. Inherent center porosity in slabs and billets.
2. Longitudinal and transverse cracking.
3. Some grades of steel cannot be bent as required on semilow-head and low-head machines.
4. Single-strand casting capacity ranges from 1/4 to 1/6 of rolling mill capacity on billets and 1/6 to 1/8 on slabs.

The elimination of center porosity is basis for the improvement claims of Böhler Strand Reduction (BSR). Böhler Brothers Ltd. of Kapfenberg, Austria, patented a process for reducing the cast section by rolling while the center is still liquid to a maximum of 20 percent reduction. Other advantages claimed are a comparative absence of segregation, surface quality comparable to that of rolled billets, and choice of several finished sizes from a single cross-section cast.[6]

Two steel companies in the United States, The Timken Roller Bearing Co. and Great Lake Steel Division of National Steel Corp., will adapt BSR to continuous casting practice.

French researchers developed rules for continuous casting of rimmed steels.[7]

A tabulation of installations throughout the world including startup date, designer,

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[6] Steel Times (London). The Bohler Strand Reducing Process. V. 195, No. 5174, Sept. 15, 1967, pp. 314–316.

[7] P. Rocquet, J. C. Rossi, and J. Adam Gironne. Comparative Quality on Flat Rolled Products Produced From Continuously Cast and Conventionally Rolled Slabs. J. Metals, v. 19, No. 8, August 1967, pp. 57–61.

number of strands, ladle capacity, and other data was presented.[8]

President Johnson signed into law at the end of November the Air Quality Act of 1967, which will accelerate the battle against pollution. The new measure allocated significantly larger sums to the clean air struggle, but puts most of the burden for enforcing tougher standards on the States.

Increased spending by the steel industry is aimed at cleaner air and water. The 1966 outlay totaled $59 million for air and water pollution control equipment. The industry has $652 million invested or authorized for pollution control and related equipment, and was one of the earliest to strive for cleaner air and water. A breakdown of expenditures between 1951 and 1965 shows that $210 million was spent on water pollution control, and $239 million for smoke, dust, and fume control—operating, maintenance or power costs are not included. As older facilities are retired and replaced with more modern equipment, pollution control devices are a regular part of the design.[9]

[8] 33/The Magazine of Metals Producing. Continuous Casting Round Up. V. 5, No. 8, August 1967, pp. 75–95.

[9] Iron & Steel Engineer. Development in the Iron and Steel Industry During 1967. V. 45, No. 1, January 1968, pp. D1–D80.

Table 2.—Pig iron produced and shipped in the United States, in 1967, by States

(Thousand short tons and thousand dollars)

State	Production	Shipped from furnaces	
		Quantity	Value
Alabama	4,307	4,292	$235,408
Illinois	6,222	6,198	348,627
Indiana	12,167	12,196	696,954
Ohio	14,377	14,332	866,826
Pennsylvania	20,541	20,593	1,152,342
California, Colorado, Utah	4,762	4,758	280,148
Kentucky, Maryland, Texas, West Virginia	10,826	10,817	622,661
Michigan, Minnesota	7,450	7,504	413,337
New York	6,148	6,130	349,398
Total [1]	86,799	86,819	4,965,700

[1] Data may not add exactly to totals shown due to independent rounding.

Table 3.—Foreign iron ore and manganiferous iron ore consumed in manufacturing pig iron in the United States, by source of ore

(Thousand short tons)

Source	1966 [1]	1967 [2]
Brazil	1,525	1,978
Canada	4,938	3,933
Chile	1,179	1,641
Peru	381	236
Venezuela	6,235	5,298
Other countries	1,230	1,509
Total	15,488	14,595

[1] Excludes 25,181 tons used in making agglomerates.

[2] Excludes 24,340 tons used in making agglomerates.

Table 4.—Pig iron shipped from blast furnaces in the United States, by grades [1]

(Thousand short tons and thousand dollars)

Grade	1966			1967		
	Quantity	Value		Quantity	Value	
		Total	Average per ton [2]		Total	Average per ton
Foundry	1,577	$87,471	$55.47	1,534	$87,072	$56.76
Basic	82,997	4,703,961	56.68	79,931	4,565,113	57.11
Bessemer	2,857	162,473	56.87	2,844	169,338	59.54
Low-phosphorous	232	14,076	60.67	215	13,055	60.72
Malleable	2,888	166,375	57.61	1,996	113,851	57.04
All other (not ferroalloys)	333	19,233	57.76	299	17,272	57.77
Total [3]	90,884	5,153,589	56.71	86,819	4,965,700	57.20

[1] Includes pig iron transferred directly to steel furnaces at same site.

[2] Revised.

[3] Data may not add to totals due to individual rounding.

Table 5.—Number of blast furnaces (including ferroalloy blast furnaces) in the United States, by States

State	January 1, 1967			January 1, 1968		
	In blast	Out of blast	Total	In blast	Out of blast	Total
Alabama	10	7	17	10	9	19
California	4	------	4	4	------	4
Colorado	4	------	4	4	------	4
Illinois	12	7	19	14	4	18
Indiana	20	3	23	22	2	24
Kentucky	2	1	3	2	1	3
Maryland	7	3	10	10	------	10
Michigan	9	------	9	9	------	9
Minnesota	2	------	2	1	1	2
New York	13	3	16	12	3	15
Ohio	31	19	50	33	14	47
Pennsylvania	40	21	61	42	19	61
Tennessee	------	3	3	------	3	3
Texas	2	------	2	2	------	2
Utah	3	------	3	3	------	3
Virginia	1	1	2	1	1	2
West Virginia	4	------	4	4	------	4
Total	164	68	232	173	57	230

Source: American Iron and Steel Institute.

Table 6.—Iron ore and other metallic materials, coke and fluxes consumed and pig iron produced in the United States, by States

(Thousand short tons)

Year and State	Metalliferous materials consumed							Net coke	Fluxes	Pig iron produced	Metalliferous materials consumed per ton of pig iron made				Coke and fluxes consumed per ton of pig iron	
	Iron and manganiferous ores		Agglomerates	Net ores and agglomerates [1]	Net scrap [2]	Miscellaneous [3]	Net total				Net ores and agglomerates [1]	Net scrap [2]	Miscellaneous [3]	Total	Net coke	Fluxes
	Domestic	Foreign														
1966:																
Alabama	2,018	1,521	3,980	7,617	135	41	7,793	3,731	990	4,389	1.735	0.031	0.009	1.775	0.850	0.225
Illinois	4,831	W	6,255	11,185	426	127	11,738	4,555	1,500	6,540	1.710	.065	.019	1.794	.696	.229
Indiana	5,045	971	13,573	19,651	187	697	20,534	7,261	1,588	11,955	1.644	.016	.058	1.718	.607	.133
Ohio	4,934	1,709	17,619	24,287	1,343	1,425	27,055	10,849	3,766	16,302	1.490	.082	.087	1.659	.666	.231
Pennsylvania	6,074	5,762	21,385	33,154	1,043	1,978	36,175	14,099	3,181	21,677	1.530	.048	.091	1.669	.650	.147
California, Colorado, Utah	W	W	4,720	8,220	849	184	9,253	2,920	925	4,896	1.679	.173	.037	1.889	.596	.189
Maryland, West Virginia, Kentucky, Texas	W	4,253	11,904	17,941	213	907	19,061	6,851	1,750	11,129	1.612	.019	.082	1.713	.616	.157
Michigan and Minnesota	W	W	11,240	12,649	237	164	13,050	4,724	1,348	7,932	1.595	.030	.021	1.646	.596	.170
New York	2,572	556	7,137	10,274	218	393	10,886	4,045	1,414	6,466	1.589	.033	.060	1.682	.626	.219
Total [4]	31,422	15,488	97,812	144,979	4,651	5,915	155,545	59,035	[5] 16,462	91,287	1.588	.051	.065	1.704	.647	.180
1967:																
Alabama	2,252	1,178	4,279	7,608	118	13	7,739	3,546	786	4,307	1.766	0.027	0.003	1.797	0.823	0.183
Illinois	3,961	W	6,399	10,129	368	338	10,835	4,273	1,378	6,222	1.628	.058	.054	1.741	.687	.221
Indiana	4,836	850	14,230	19,320	191	465	19,976	7,273	1,659	12,167	1.588	.016	.038	1.642	.598	.136
Ohio	4,321	1,095	16,123	20,940	1,024	1,508	23,472	9,509	3,041	14,377	1.457	.071	.105	1.633	.661	.212
Pennsylvania	5,535	4,643	21,528	30,882	959	1,594	33,435	13,042	2,530	20,541	1.503	.047	.078	1.628	.635	.123
California, Colorado, Utah	W	W	4,823	8,218	870	145	9,233	2,811	860	4,762	1.726	.183	.030	1.939	.590	.181
Maryland, West Virginia, Kentucky, Texas	W	3,319	12,458	17,933	122	905	18,960	6,648	1,689	10,826	1.656	.011	.084	1.751	.614	.156
Michigan and Minnesota	W	W	10,528	12,818	232	187	13,237	4,448	1,230	7,450	1.721	.031	.025	1.777	.597	.165
New York	1,363	544	7,667	9,382	215	487	10,084	3,731	1,079	6,148	1.526	.035	.079	1.640	.607	.176
Total [4]	28,175	14,595	98,035	137,230	4,099	5,643	146,972	55,280	[6] 14,252	86,799	1.581	.047	.065	1.693	.637	.164

W Withheld to avoid disclosing individual company confidential data; included with total.

[1] Net ores and agglomerates equal ores plus agglomerates plus flue dust used minus flue dust recovered.

[2] Excludes home scrap produced at blast furnaces.

[3] Does not include recycled material.

[4] Data may not add exactly to totals shown due to independent rounding.

[5] Fluxes consisted of the following: 9,789 limestone, 6,251 dolomite, and 423 other fluxes excluding 5,133 limestone, 2,541 dolomite, and 331 other fluxes used in agglomerate production at or near steel plants and an unknown quantity used in making agglomerates at mines.

[6] Fluxes consisted of the following: 8,246 limestone, 5,604 dolomite, and 402 other fluxes excluding 5,111 limestone, 2,877 dolomite, and 317 other fluxes used in agglomerate production at or near steel plants and an unknown quantity used in making agglomerates at mines.

Table 7.—Steel production in the United States, by type of furnace [1]

(Thousand short tons)

Year	Open hearth		Bessemer	Basic oxygen process	Electric	Total
	Basic	Acid				
1963	88,437	397	963	8,544	10,920	109,261
1964	97,655	443	858	15,442	12,678	127,076
1965	93,866	327	586	22,879	13,804	131,462
1966	84,804	221	278	33,928	14,870	134,101
1967	70,550	140	(2)	41,434	15,089	127,213

[1] Includes only that steel for castings produced in foundries operated by companies manufacturing steel ingots. Omits about 2 percent of total steel production.
[2] Included with open hearth.

Source: American Iron and Steel Institute.

Table 8.—Metalliferous materials consumed in steel furnaces in the United States

(Thousand short tons)

Year	Iron ore		Agglomerates [1]	Pig iron	Ferroalloys [2]	Iron and steel scrap
	Domestic	Foreign				
1963	1,783	3,995	885	66,188	1,557	56,506
1964	2,114	4,816	1,379	78,925	1,819	64,348
1965	1,818	4,400	[3] 1,061	81,040	1,898	68,272
1966	1,348	3,768	[4] 870	83,947	1,915	68,778
1967	954	2,905	[5] 600	80,404	1,818	65,027

[1] Includes consumption of pig iron and scrap by ingot producers and iron and steel foundries.
[2] Includes ferromanganese, spiegeleisen, silicomanganese, manganese briquets, manganese metal, ferrosilicon, ferrochromium alloys, and ferromolybdenum.
[3] Includes 567 sinter, 386 pellets, 100 nodules, and 8 other agglomerates. (418 foreign origin.)
[4] Includes 435 sinter, 348 pellets, 86 nodules and other agglomerates. (348 foreign origin.)
[5] Includes 306 sinter, 217 pellets, 77 nodules and other agglomerates. (378 foreign origin.)

Table 9.—Consumption of pig iron in the United States, by type of furnace

(Thousand short tons)

Type of furnace or equipment	1967	
	Thousand short tons	Percent of total
Open hearth	46,386	53.1
Bessemer	87	.1
Oxygen converter	33,553	38.4
Electric [1]	378	.4
Cupola	3,162	3.6
Air	147	.2
Direct castings	3,658	4.2
Total	87,371	100.0

[1] Includes a small quantity of pig iron consumed in crucible furnaces.

Table 10.—Consumption of pig iron in the United States, by districts and States

(Thousand short tons)

District and State	1967
New England:	
Connecticut	31
New Hampshire	(1)
Massachusetts	48
Rhode Island	38
Vermont	6
Total	123
Middle Atlantic:	
New Jersey	86
New York	5,742
Pennsylvania	20,913
Total	26,741
East North Central:	
Illinois	6,208
Indiana	12,462
Michigan	7,377
Ohio	13,869
Wisconsin	215
Total	40,131
West North Central:	
Iowa	71
Kansas	6
Minnesota	491
Missouri	31
Total	599
South Atlantic:	
Delaware	(1)
Maryland	5,713
Florida	3
Georgia	12
North Carolina	(1)
South Carolina	13
Virginia	106
West Virginia	2,259
Total	8,106
East South Central:	
Alabama	3,765
Kentucky	1,623
Tennessee	125
Total	5,513
West South Central:	
Louisiana	1
Oklahoma	14
Texas	1,190
Total	1,205
Rocky Mountain: Colorado, Utah	(1)
Pacific Coast:	
California	2,245
Washington	12
Total	2,257
Other States	2,694
Grand total [2]	87,371

[1] Included with other States total.
[2] Does not add exactly to total because of individual rounding

Table 11.—Average value of pig iron at blast furnaces in the United States, by States
(Per short ton)

State	1967
Alabama	$54.85
California, Colorado, Utah	58.88
Illinois	56.25
Indiana	57.15
New York	57.00
Ohio	60.48
Pennsylvania	55.96
Other States [1]	56.55
Average	57.20

[1] Kentucky, Maryland, Michigan, Minnesota, Texas, West Virginia.

Table 12.—Free-on-board value of steel mill products in the United States in 1966 [1]
(Cents per pound)

Product	Carbon	Alloy	Stainless	Average
Ingots	(2)	17.832	41.414	6.104
Semifinished shapes and forms	5.862	11.755	46.769	7.062
Plates	6.823	9.684	51.877	7.933
Sheets and strips	7.276	16.082	45.112	8.172
Tin mill products	9.278	-------	-------	9.278
Structural shapes and piling	6.615	(3)	-------	6.615
Bars	8.114	14.274	65.721	9.883
Rails and railway-track material	7.630	-------	-------	7.630
Pipes and tubes	10.562	14.819	112.535	11.881
Wire and wire products	12.943	35.401	83.094	14.386
Other rolled and drawn products	11.849	17.552	72.198	14.103
Average total steel	7.982	13.486	55.741	9.015

[1] This table represents the weighted average value based on the quantity of each type of steel shipped; therefore, it reflects shifts in the distribution of the 3 classes of steel.
[2] 15 to 35 percent of total shipments are included with interplant transfers. Transfers to other plant of the same company are included with shipments to other companies and only constitute about 10 to 25 percent for carbon steel, electrical sheets, strips and wire rope cable, alloy steel wire rods, and cold finished bars.
[3] Included with Plates.

Table 13.—U.S. exports of major iron and steel products

Products	1966		1967	
	Short tons	Value (thousands)	Short tons	Value (thousands)
Semimanufactures:				
Ingots and other primary forms:				
Puddled bars and pilings, blocks, lump and other primary forms of iron or steel, n.e.c	2,684	$332	5,880	$699
Blooms, billets, ingots, slabs, sheet bars, and roughly forged pieces	r 338,544	r 28,143	302,498	26,330
Coils for rerolling	42,840	32,940	60,486	34,446
Blanks for tubes and pipes, iron or steel	1,039	182	1,453	251
Total	r 385,107	r 61,597	370,317	61,726
Bars, rods, angles, shapes and sections:				
Wire rods	12,184	2,269	7,107	1,598
Bars, rods, and hollow-drill steel	72,922	24,643	78,857	26,193
Concrete reinforcing bars	24,219	3,394	21,577	2,904
Angles, shapes, and sections	r 130,206	r 22,240	113,789	18,454
Plates and sheets:				
Steel plates	17,934	8,787	15,622	8,517
Steel sheets	165,153	45,968	140,347	41,905
Black plate	24,611	1,982	19,854	1,895
Iron and steel plates, n.e.c	179,362	39,817	254,410	53,725
Tinplate and terneplate	301,394	44,501	283,542	25,687
Tinplate circles, cobbles, strip and scroll	12,354	1,229	15,380	1,485
Hoop and strip	49,720	25,460	56,874	28,071
Total	r 990,059	r 220,290	1,007,359	210,434

Table 13.—U.S. exports of major iron and steel products—Continued

Products	1966		1967	
	Short tons	Value (thousands)	Short tons	Value (thousands)
Manufactures:				
Rails and railway track construction materials:				
Rails	30,071	$4,333	21,617	$3,211
Joints and tie plates	9,831	1,901	8,605	1,820
Sleeper and track material of iron or steel, n.e.c.	3,681	1,894	2,126	1,304
Wire:				
Steel wire coated or uncoated	4,892	3,878	4,744	4,474
Steel wire, bare	18,605	6,140	10,995	4,191
Galvanized wire	4,669	1,714	3,775	1,418
Barbed wire	1,124	305	752	237
Fencing and fence gates of iron or steel wire	2,062	[1] 767	1,860	[1] 691
Fencing wire, n.e.c.	684	324	775	295
Spring wire	11,310	4,814	13,340	6,080
Cables, ropes, bands, and slings	12,155	8,726	12,858	8,585
Tubes, pipes, and fittings:				
Cast-iron pressure pipe and fittings	r 52,296	r 10,254	22,919	6,236
Cast-iron soil pipe and fittings	23,844	4,630	33,026	6,325
Steel tube and pipe fittings, unions and flanges	17,419	21,687	17,189	21,261
Steel tube and pipe fittings, welded	12,331	19,469	13,324	20,258
Malleable iron tube and pipe fittings, n.e.c.	1,463	1,307	1,623	1,625
Electrical conduit fittings of iron or steel	11,358	8,731	10,655	8,040
Iron tube and pipe fittings n.e.c.	6,029	8,172	6,217	8,769
Seamless tubes and pipe	213,411	84,781	183,802	77,165
Welded, clinched or riveted tubes and pipe	68,735	29,525	70,602	30,982
Castings and forgings	77,150	50,874	91,523	58,425
Finished structural parts and structures:				
Fabricated structural iron and steel	r 85,824	r 34,267	77,078	31,621
Doors, door and window sash, frames, and molding and trim	2,645	2,982	2,270	2,776
Fabricated steel plate, including stacks and weldments	13,355	5,221	14,311	6,496
Construction materials, n.e.c.	r 11,480	r 6,223	8,734	4,918
Storage tanks, lined or unlined	27,626	16,803	19,514	11,585
Nails, tacks, staples and spikes:				
Track spikes	741	217	663	199
Nails, tacks, staples, n.e.c.	7,525	5,801	7,289	5,879
Bolts	17,650	16,314	19,948	18,122
Nuts	5,234	8,059	5,126	8,967
Screws, rivets, washers	13,953	20,104	14,140	21,246
Total	r 769,153	r 390,217	701,400	383,201
Advanced manufactures:				
Buildings (prefabricated and portable)	--------	r 5,835	----------	7,802
Finished structures and structural parts of iron and steel n.e.c.	--------	18,897	----------	17,737
Hardware and parts	--------	8,826	----------	9,609
Chains and parts	11,922	17,458	11,884	16,742
House heating boilers	--------	19,278	----------	19,407
Plumbing fixtures and fittings	--------	4,976	----------	5,663
Tools	--------	r 52,541	----------	51,676
Utensils and parts (cooking, kitchen and hospital)	r 3,793	7,988	3,597	7,901
Other	--------	67,860	----------	65,401
Total	--------	r 203,659	----------	201,938
Grand total	--------	r 875,763	----------	857,299

r Revised.

[1] In addition wire cloth as follows: 1966, $3,421,345 (7,489,299 square feet); 1967, $3,813,600 (7,734,244 square feet).

Table 14.—U.S. imports for consumption of pig iron, by countries

(Short tons)

Country	1965	1966	1967
Australia	801	13,241	---
Belgium-Luxembourg	2,065	1,793	---
Brazil	73,537	---	---
Canada	485,089	393,593	408,066
Czechoslovakia	---	67,968	---
Finland	66,422	64,655	33,617
Germany:			
East	r 82,289	104,891	49,700
West	64,220	79,750	41,947
Italy	68	---	---
Mexico	---	---	28
Mozambique	---	22,801	---
Netherlands	---	4,506	9,869
Norway	666	---	10,900
Rhodesia	---	72,664	22,400
Rumania	---	32,599	---
South Africa, Republic of	12,867	133,824	---
Spain	42,085	9,002	---
Sweden	11,203	---	1,922
U.S.S.R.	34,188	185,394	---
United Kingdom	6,595	58	7,075
Venezuela	---	---	19,710
Total:			
Short tons	882,095	1,186,739	605,234
Value (thousands)	$38,438	$45,914	$27,599

r Revised.

Table 15.—U.S. imports for consumption of major iron and steel products

Products	1966		1967	
	Short tons	Value (thousands)	Short tons	Value (thousands)
Iron products:				
Cast iron pipes, tubes, and fittings	26,336	$3,963	20,183	$3,593
Malleable cast-iron fittings	3,779	1,636	7,124	2,763
Bars of wrought iron	484	138	306	93
Castings and forgings	5,853	2,039	6,839	2,658
Total	36,452	7,776	34,452	9,107
Iron or steel Products:				
Ingots, blooms, billets, slabs and sheet bars	218,861	35,153	367,954	31,298
Bars:				
Concrete reinforcement bars	r 673,424	49,488	567,026	42,003
Solid and hollow, n.e.c	586,505	67,691	650,125	75,609
Hollow drill steel	5,400	2,032	5,014	1,953
Plates and sheets:				
Black plate	9,327	851	9,887	1,001
Steelplate	948,761	86,875	1,022,939	95,145
Steel sheets	3,620,636	379,374	4,212,528	437,829
Plates and sheets of iron or steel	3,150	986	2,668	684
Plates, sheets and strip of iron or steel	19,568	3,831	11,558	3,030
Strip of iron or steel	59,633	23,236	67,591	23,112
Tinplate and terneplate	125,080	22,097	156,351	27,112
Structural iron and steel	86,043	19,376	119,564	27,682
Angles, shapes and sections	1,354,450	122,045	1,030,169	94,346
Wire rods of steel	1,150,309	108,022	1,076,472	101,865
Sheet piling	40,596	4,079	29,669	3,050
Pipes, tubes and fittings	1,088,433	162,415	1,098,157	174,036
Rails for railways	19,495	1,873	18,208	1,607
Rail braces, tie plates and joint bars	856	117	2,048	246
Circular saw plates	(1)	1,370	(1)	1,327
Wire:				
Barbed wire	76,501	9,806	69,387	9,392
Round wire	434,897	82,156	432,340	83,046
Flat wire	15,637	7,441	16,731	7,882
Rope and strand	80,720	23,443	94,369	27,634
Galvanized wire fencing and fencing wire	52,990	7,861	56,373	8,598
Wire used in card clothing	NA	342	NA	319
Bale ties of iron or steel	25,006	3,278	16,247	2,138
Nails	289,161	43,134	229,845	37,411
Steel castings and forgings	21,554	5,358	48,533	13,866
Total	r 11,006,993	1,273,730	11,411,753	1,333,221
Advanced manufactures:				
Bolts, nuts, rivets, and washers	108,259	36,695	127,398	43,664
Chains and parts	21,008	12,717	19,765	12,090
Screws	----------	17,880	----------	20,342
Tools	----------	25,055	----------	36,523
Other	----------	5,758	----------	9,530
Total	----------	98,105	----------	122,149
Grand total	----------	1,379,611	----------	1,464,477

r Revised. NA Not available.
1 Saws reported in number, 1966: 157,990; 1967: 321,425.

Table 16.—World production of pig iron (including ferroalloys), by countries [1] [2]

(Thousand short tons)

Country	1963	1964	1965	1966	1967 [p]
North America:					
Canada	6,059	[r] 6,717	[r] 7,261	7,400	7,108
Mexico (includes sponge iron)	[r] 1,134	[r] 1,291	[r] 1,325	[r] 1,595	1,836
United States	73,853	87,922	91,016	94,000	89,479
South America:					
Argentina	481	666	751	[r] 593	692
Brazil	2,773	2,937	2,644	3,237	[e] 3,340
Chile	480	494	355	[r] 491	549
Colombia	223	226	225	186	228
Peru [3]	32	30	22	[r] 31	32
Venezuela	333	356	368	387	465
Europe:					
Austria	2,326	2,434	2,429	2,424	2,363
Belgium	7,622	[r] 8,870	9,222	9,072	9,912
Bulgaria	292	504	766	913	1,093
Czechoslovakia	5,847	6,361	[r] 6,468	[r] 6,910	[e] 7,055
Denmark	76	79	83	90	83
Finland	406	710	1,085	[r] 1,030	1,144
France [4]	[r] 15,770	[r] 17,461	[r] 17,379	[r] 17,178	17,284
Germany:					
East	2,370	2,491	2,577	2,698	2,778
West	25,253	29,963	29,751	28,013	30,166
Hungary	1,544	1,653	1,750	[r] 1,812	1,813
Italy	4,264	3,996	6,207	7,074	8,228
Luxembourg	3,954	4,620	4,569	4,367	4,365
Netherlands	1,884	2,147	2,606	2,435	[e] 2,845
Norway	826	985	1,202	1,256	[e] 1,360
Poland	5,947	6,220	6,349	6,455	7,254
Portugal	265	[r] 298	304	274	[e] 316
Rumania	1,881	2,121	2,226	2,423	[e] 2,400
Spain	2,187	2,172	[r] 2,653	[r] 2,441	[e] 3,010
Sweden	2,232	2,583	2,713	2,646	2,770
Switzerland	49	35	30	30	26
U.S.S.R. [5]	64,696	68,759	72,955	[r] 77,453	82,453
United Kingdom	16,342	19,347	19,555	17,595	16,971
Yugoslavia	1,168	1,184	1,295	1,342	1,297
Africa:					
Rhodesia, Southern	260	351	276	287	NA
South Africa, Republic of	2,676	3,182	3,972	4,126	3,770
United Arab Republic	226	212	191	[e] 185	NA
Asia:					
China, mainland [e]	18,700	19,800	20,900	22,000	15,400
India	7,431	7,425	7,839	7,981	7,665
Japan	22,525	26,951	31,041	36,094	45,239
Korea:					
North	[r] 1,278	[r] 1,477	[e r] 1,600	[e r] 1,650	[e] 1,950
South [3]	[r] 9	[r] 8	[r] 29	[r] 47	[e] 34
Taiwan	60	68	79	78	[e] 95
Turkey [6]	434	442	551	906	934
Oceania: Australia	4,118	[r] 4,463	[r] 4,755	[r] 5,295	5,575
Total [1] [7]	[r] 310,286	[r] 350,011	[r] 369,374	[r] 382,500	391,377

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Pig iron is also produced in the Congo (Kinshasa), but quantity produced is believed to be negligible.

[2] Compiled mostly from data available May 1968.

[3] Excluding ferroalloys.

[4] Excluding electric furnace and aluminothermic ferroalloys.

[5] U.S.S.R. in Asia included with U.S.S.R. in Europe.

[6] Includes foundry iron.

[7] Total is of listed figures; no undisclosed data included.

Table 17.—World production of steel ingots and castings, by countries [1]

(Thousand short tons)

Country	1963	1964	1965	1966	1967 [p]
North America:					
Canada	[r] 8,197	[r] 9,128	[r] 10,068	10,003	**9,694**
Mexico	2,247	2,593	2,743	[r] 3,046	**3,332**
United States [2]	109,261	127,076	131,462	134,101	**127,213**
South America:					
Argentina	1,006	[r] 1,394	[r] 1,508	[r] 1,397	**1,462**
Brazil	[r] 3,158	[r] 3,369	[r] 3,333	[e] 4,210	**[e] 4,130**
Chile	574	644	526	[r] 636	**703**
Colombia	245	254	267	239	**278**
Peru	84	90	104	[r] 88	**87**
Uruguay	8	15	14	[r] 11	**14**
Venezuela	401	485	[r] 689	[r] 592	**775**
Europe:					
Austria	3,249	3,521	3,551	3,520	**3,332**
Belgium	8,298	9,624	10,107	9,829	**10,621**
Bulgaria	508	524	648	772	**1,366**
Czechoslovakia	8,375	9,234	9,478	10,062	**[e] 10,800**
Denmark	396	437	454	446	**438**
Finland	340	409	400	440	**434**
France	19,214	21,501	21,319	21,589	**21,688**
Germany:					
East	4,512	4,751	4,813	[r] 5,006	**[e] 5,180**
West	34,830	41,159	40,588	38,929	**40,503**
Greece	230	231	231	231	**176**
Hungary	2,617	2,607	2,778	2,919	**3,019**
Ireland	22	22	22	30	**NA**
Italy	11,196	10,795	13,978	15,034	**17,516**
Luxembourg	4,445	5,025	5,054	4,839	**4,939**
Netherlands	2,582	2,924	3,468	3,612	**3,753**
Norway	597	677	745	[r] 805	**[e] 872**
Poland	8,823	9,450	10,018	10,858	**11,520**
Portugal	[r] 245	265	289	[r] 284	**333**
Rumania	2,981	3,350	3,777	4,045	**4,505**
Spain	2,747	3,472	3,876	[r] 4,296	**5,064**
Sweden	4,300	[r] 4,899	5,208	5,251	**5,256**
Switzerland	355	380	380	472	**489**
U.S.S.R. [3]	[r] 88,434	[r] 93,744	100,333	[r] 106,822	**112,656**
United Kingdom	25,222	29,378	30,252	27,233	**26,763**
Yugoslavia	1,750	1,849	1,950	2,058	**2,019**
Africa:					
Rhodesia, Southern	93	141	143	143	**NA**
South Africa, Republic of	3,124	3,463	3,630	3,643	**4,111**
United Arab Republic	217	194	197	[e] 200	**NA**
Asia:					
China, mainland [e]	13,200	15,400	16,500	17,600	**12,100**
India	6,581	6,554	7,129	7,198	**7,040**
Japan	34,724	43,871	45,372	52,673	**68,513**
Korea:					
North	1,127	[r] 1,248	1,356	[e] 1,435	**1,598**
South	179	[r] 184	[r] 209	[r] 237	**363**
Taiwan	303	331	485	331	**[e] 330**
Turkey	428	536	734	1,035	**1,164**
Oceania: Australia	5,129	[r] 5,563	[r] 6,021	6,493	**6,931**
Total [4]	[r] 426,554	[r] 482,761	[r] 506,207	[r] 524,693	**543,080**

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Compiled mostly from data available May 1968.

[2] Data from American Iron and Steel Institute. Excludes production of castings by companies that do not produce steel ingots.

[3] U.S.S.R. in Asia included with U.S.S.R. in Europe.

[4] Total is of listed figures only; no undisclosed data included.