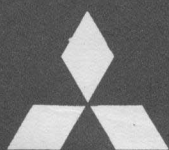


**IRON
AND
STEEL
MANUFACTURING
MACHINERY**

mitsubishi shipbuilding & engineering co., ltd.

IRON and STEEL

MANUFACTURING MACHINERY



Effective from June 1st, 1964,
the name of our Company is



MITSUBISHI
HEAVY INDUSTRIES, LTD.

MITSUBISHI SHIPBUILDING & ENGINEERING CO., LTD.

Our Manufacturing Machinery for Iron & Steel

**Sintering Equipment, Blast Furnaces, Mixer type Hot Metal Cars,
Converters, Various Industrial Furnaces, Various Rolling Mills,
Various Sheet Treatment Lines, Gas Cleaning Equipment, Special
Cranes for Iron Works**

MAIN ACTIVITIES

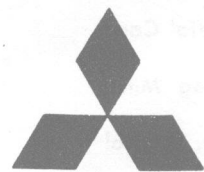
- (1) The design, construction and repair of ships.**
- (2) The manufacture of Diesel engines, steam turbines, boilers, water turbines, gas turbines and other prime movers ; machine tools, textile machinery, chemical industrial machinery, mining machinery ; steel manufacturing and other machinery.**
- (3) The manufacture and construction of steel bridges, steel towers, steel frames and other steel structures.**
- (4) The manufacture and repair of arms.**

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IRON & STEEL MANUFACTURING MACHINERY

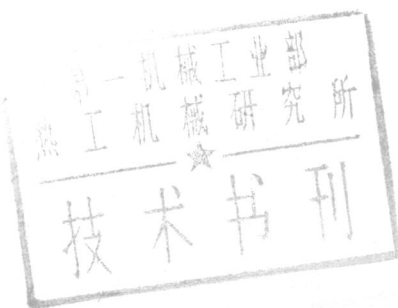
鋼鐵冶煉加工設備



CONTENTS

Introduction of our Hiroshima Works	1
鋼鐵設備 Iron and Steel Equipment	2
高爐	2-1
高爐布料器	2-2
燒結設備	2-3
混鐵爐型鐵水車	2-4
L. D. 和 Kaldo 轉爐	2-5
各種工業用爐	3
(均熱爐, 加熱爐及其他)	
軋機	4
初軋和板坯軋機	4-1
帶鋼熱軋機	4-2
帶鋼冷軋機	4-3
平整機	4-4
綫材軋機	4-5
精整作業綫設備 Processing Equipment	5
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縱橫剪切綫	5-4
不銹鋼後步精整工序	5-5
煤氣清洗設備	6
吊車, 裝料機及鍛造操作機 Cranes, Chargers and Forging Manipulators	7

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三菱造船和工程公司
MITSUBISHI
SHIPBUILDING & ENGINEERING
CO., LTD.

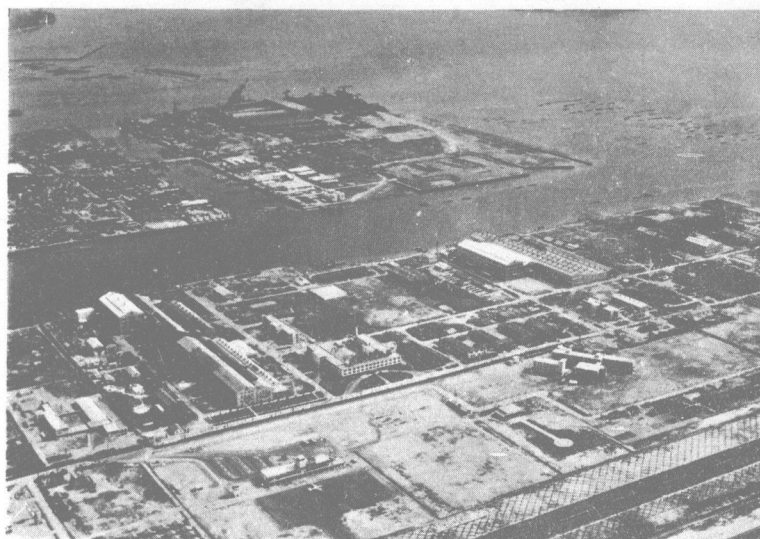


INTRODUCTION OF OUR HIROSHIMA WORKS

Outline of Our Works for Land Equipment

We possess the Nagasaki Shipbuilding Yard, the Shimonoseki Shipbuilding Yard, the Hiroshima Precision Machinery Works and the Hiroshima Shipbuilding Yard as fabricating plants. Above all, the Hiroshima Shipbuilding Yard boasts a firm position in the industry as a land equipment manufacturing plant.

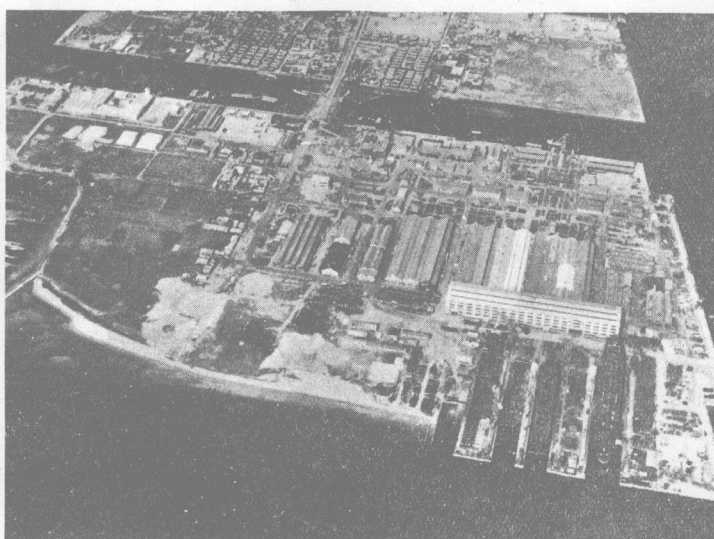
The Hiroshima Shipbuilding Yard consists of the Kannon Works (Machinery Works) and the Eba Works (Shipbuilding and Structural Steel Works). The number of employees amounts to 6,300 persons. Equipment for Iron and Steel Industry are chiefly designed and manufactured at the Kannon Works.



KANNON WORKS

Site Area: 709,587 square meters

Building Area: 297,476 square meters



EBA WORKS

Site Area: 741,089 square meters

Building Area: 88,035 square meters

MITSUBISHI SHIPBUILDING & ENGINEERING CO., LTD.



As a machinery works, the Hiroshima Shipbuilding Yard is equipped with the most modern and high performance equipment. It also boasts profound research experience and highly qualified engineering staff. The various types of machinery made here are exported to every corner of the world. The item list of the types of land equipment made at this works is shown below.

鋼鐵廠設備

Machineries for Iron and Steel Works

Prime Mover for Land Equipment

Prime Mover for Ships

Machineries for Mines

Chemical Plant Facilities and Related Chemical Equipment

Equipment for Cement Manufacturing

Equipment for Fiber Manufacturing

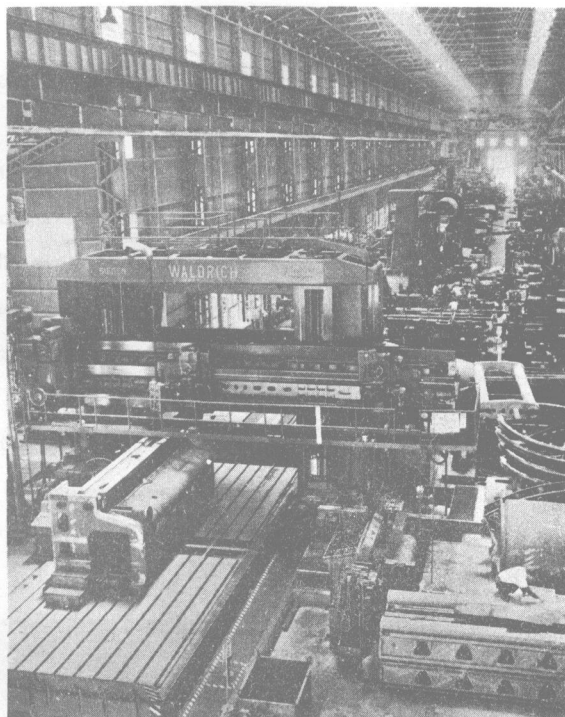
Equipment for Paper Manufacturing

Dust Collector

Various Precision Machinery

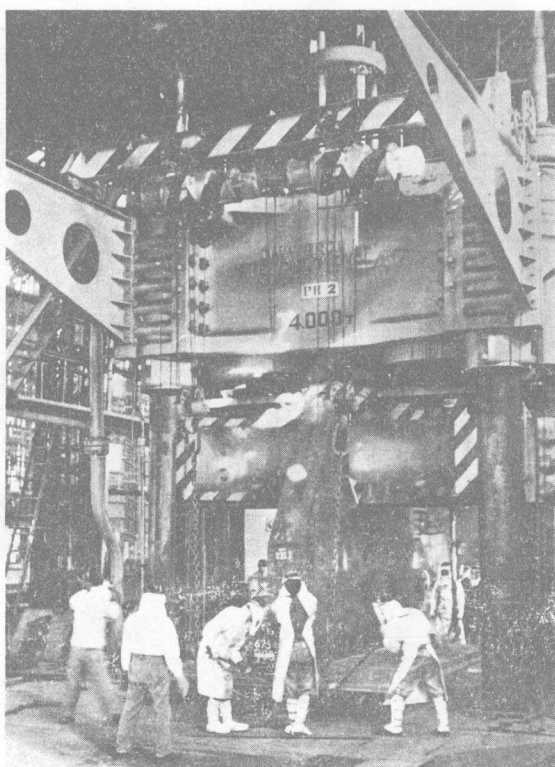
Various Cranes

Various Steel Structures with Bridge

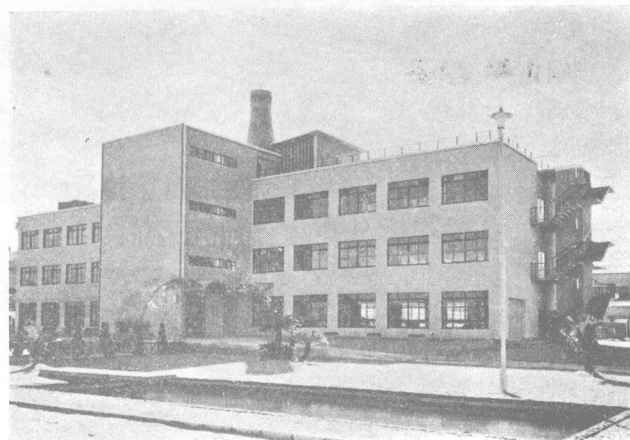


Interior View of Fabrication Plant
Waldrich Siegen Horizontal Boring and
Milling Machine

加工車間の臥式搪銑床



4,000 Tcn
Hydraulic Press 水壓機



Laboratory 試驗工廠

Iron and Steel Manufacturing Machinery

INTRODUCTION OF
OUR HIROSHIMA
WORKS

CASTING FACILITIES 鑄造設備

Classification	Type	Specifications	Manufacturers
Smelting Facility 熔煉設備	Electric Furnace Cupola Furnace Crucible Furnace Crucible Furnace	(high frequency wave) (special high temperature melting)	Daido, Ushio, Hitachi, Kobe Machineries, Japan Crucible, Japan Crucible Nicchiku
	Annealing Furnace	Heavy oil burning type Coal Burning Type	Sanken Sangyo, Mitsubishi Shipbuilding (Hiroshima) Chugai Furnace
Annealing Furnace and Drying Furnace for Mold 退火爐及模子乾燥爐	Drying Furnace	Heavy Oil Burning Type Coal Burning Type	Mitsubishi Shipbuilding (Hiroshima) Chugai Furnace Yoshikawa
Cleaning Apparatus 清理設備	Hydraulic Pressure Sand Blast Apparatus Shot Blast		Badiche Kubota Works
Vacuum Casting Equipment 真空鑄造設備			Kobe Seiko

FORGING FACILITIES 鍛造設備

Classification	Type	Specifications	Manufacturers
Press and Forging Hammer 壓力機及鍛錘	Forging Press Hammer	Operating Capacity 500 t	Komatsu
Heat Treatment Facility 熱處理設備	Nitrified Furnace	with Hokushin Thermocouple Controller	Mitsubishi Shipbuilding (Hiroshima)
	Vertical Type Electrical Adjustment Furnace		
	Flame Inserting Device	Vertical Type Horizontal Type	
	Heavy Oil Adjustment Furnace		Sanken Sangyo
	Electrical Plating Device	for Nickel, Chrome, Copper, Cadmium Plating	Chuo Seisakusho
	Rotor Stability Test Furnace	with Program Temperature Controller Electron Tube 6 Point Recording Meter	Mitsubishi Shipbuilding (Hiroshima)



Classification	Type	Specifications	Manufacturers
Presses 水壓機 Presses	Hydraulic Press	Operating Capacity 4000 t	Davy Brothers
		" 600 t	Henry Berry
		" 1500 t	Suga Hydraulics
		" 200 t	Osaka Heavy Industries
	Flanging Press	" 270 t	Osaka Heavy Industries
	Friction Press	" 200 t	Japan Forging
	Cantilever Press	" 50 t	Kobe Shipbuilding
	Flanging Machine	Max Plate Thickness 3/4"	Blue Valley
Bending Rollers 彎板機 Bending Rollers	Vertical Type Bending Roller	Thickness of Plate 44 mm Speed of Roll Surface 3.5 m/min	Ueda Iron Works
	Horizontal Type Bending Roller	Thickness of Plate 22 mm Speed of Roll Surface 4.5 m/min	
	Horizontal Type Bending Roller	Thickness of Plate 6 mm Speed of Roll Surface 4.5 m/min	
	Unionmelt Welding Machine	Portable Type	Linde Corp.
		Side beam Type	Osaka Transformer
		Manipulator Type	Suetsugu Iron Works
Welding Facility 焊接設備 Welding Facility	Semi-Automatic Welder	Sigma SM13 Type	Osaka Transformer
	Alternating Current Welder		Osaka Transformer
			Hitachi
	Direct Current Welder		Habart corp.
			Japan Metallurgy
	Inert Gas Welder		Kubota Iron Works
	Positioner		Ube Iron Industries
Annealing Furnace 退火爐 Annealing Furnace	Electric Annealing Furnace		Daido Steel
	Heavy Oil Annealing Furnace		Sanken Sangyo
	Pipe Bending Machine	6"φ 4"φ	Mitsubishi Shipbuilding (Hiroshima)

PRINCIPAL TESTING FACILITIES 主要的試驗設備

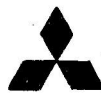
Classification	Type	Specifications	Manufacturers
Testing Facility 試驗設備 Testing Facility	X-Ray Apparatus		Seifelt
			Shimadzu
	Gamma Ray Detector		Rigaku Denki
			Japan Isotope
	Magnetic Detector		Richseifert
			Shimadzu
			Mitsubishi Shipbuilding (Hiroshima)
	Super Sonic Detector		Tokyo Instruments
	Sunpun Detector		PPP Patents Corp.

Iron and Steel Manufacturing Machinery

INTRODUCTION OF
OUR HIROSHIMA
WORKS

METAL MACHINE TOOL 金屬切削機床

Classification	Type	Specifications	Manufacturers
Lathes 車床	Large Size	Distance between centers 13,500 mm 9,000 5,600 5,700 5,800 8,050 4,000 1,500	Niles Corp. Wagner Corp. Dainippon Kohki Ikegai Iron Works Osaka Machineries Nobehara Iron Works Oerlikon Mitsubishi Shipbuilding (Hisoshima)
Vertical Lathes 立車		Table Diameter 5,000 mm 3,800 1,800 1,600 1,000	Shibaura Kosaku Karatsu Iron Works Berthiez Corp. Froriep Corp. Osaka Machinery
Horizontal Boring Machines 臥式搪床	Floor Top Type	Main Spindle Diameter 160/260 mm 180 1,300 95/140	Froriep Corp. Niigata Iron Works Shibaura Kohsaku Innocenti Corp. Karatsu Iron Works Nagaoka Iron Works Osaka Machinery
	Planing Type Table Top Type Portable Type	100 180	
Milling and Boring Machines 銑搪床	Large Size Complex Machine	Diameter of Spindle FAF 305/20 BFS 100	Innocenti Corp. Collet Corp.
Milling Machines 銑床	Planing Type Vertical Type		Osaka Machinery Showa Kohki Osaka Machinery Herbert Droop & Rien Osaka Machinery Wanderer Osaka Machinery Hitachi Seiko Pratt & Whitney
	(Versatile) Horizontal Type Versatile Screw Milling		
Boring Machines 搪床	NO 6 RE 3S		Mitsui Seiki Oerlikon
Planing Machines 鉋床	Gate Type	HF 4500/3500 II 8DD 4030	Waldrich Siegen Waldrich Coburg Karatsu Iron Works Karatsu Iron Works Pond Corp. Kitagami Iron Works Kubota Iron Works Koike Oxygen
	Cantilever Type Gate Type Gate Type Wall Type Frame Planer	POW-S 3WL-5330	



Name	Type	Specifications	Manufacturers
Vertical Slotting Machines 插床	1000 F 750 H	Table Diameter 1800 1300	Osaka Kikai Osaka Kikai
Frame Planing Machines 龍門鉋		Maximum Maching Length 12,500 9,000	Karatsu Iron Works Scottish
Tooth Cutting Machines 螺紋切削機床	HH 500 GH-3M GH-7 GH-60 NO 3 75 KHG (Versatile) (Bevel Gear)	Maximum Machining Diameter 6,000 5,600 2,100 1,524 2,000 3,000 1,200	Shibaura Machinery Karatsu Iron Works Takeda Iron Works Schuess Corp. Heidenreich Corp.
Shaping Machines 成型加工機床	for Pinion	Maximum Machining Diameter 3,200 1,180 1,100	Mitsubishi Shipbuilding (Hiroshima) Mitsubishi Machinery (Hiroshima)
Grinders 磨床	180 NR (Roll) Cylinder Plane Plane Plane Plane KDL 10 Plane	Diameter of Grinder 1,000 762 518 500 400 800	Niigata Iron Works Schmaltz Corp. Mattison Corp. Blanchard Corp. Heald Corp. Shibaura Machinery
Radial Drilling Machines 搖臂鑽床	HK 159 Travelling Type HK 106 Travelling Type 5 FT 2000 mm DR 3 2000 mm 2500 R KH 1073 mR DPU 80 (Versatile)	Maximum Travelling radius 4,600 2,950 2,000 2,000 2,200 2,500 3,000 2,100	KOLB Corp. KOLB Corp. CARL ION. Raboma Okuma Tekko Shin Nihon Kiko KOLB Corp. Okuma Tekko
Tool Grinding Machines 工具磨	MSJ (for face cutter) CW 30 (for hob) AMS 1000 (for face mill cutter)		Kapp Corp Klingelberg Corp Walter Corp.

TEST MEASUREMENT EQUIPMENT 實驗測量設備

Name	Type	Specifications	Manufacturers
Balancing Machines 平衡機		20 t 10 t 10 t 5 t 2 t 0.5 t	Mitsubishi Shipbuilding (Hiroshima) Nagahama Works Mitsubishi Shipbuilding (Hiroshima)
Test Boilers 試驗鍋爐	2 Body Type Water Tube	10 t/h 15 t/h	Mitsubishi Shipbuilding (Hiroshima)
Pressure Test Devices 壓力試驗機	Compressor	Power 250 HP 100 HP 300 HP	Mikuni Heavy Industries Suction Gas Mitsubishi Electric
Tensile Strength Testers 拉力試驗機	Relay Type Amsler Type	Capacity 100 t 30 t	Kawanishi Works Maekawa Works
Impact Testers 沖擊試驗機	Izod Type Charpy Type	Capacity 17 kg-m 30 kg-m	Fujimura Works Shimadzu Works
Measuring Devices 測量裝置	Gear Pitch Tester Length Measuring Devices Optimeter Optical Dividing Head Projector	TMA Type, TMEZ Type 48" 0.001 mm	Maag Corp. Newall Corp. Carl Zess Corp Carl Zess
Measuring Instruments 測量儀器	Pressure Gauge Tester Thermometer Tester Standard Balance Balance Tester		Ohbayashi Precision Tani Seisakusho Mitsubishi Shipbuilding (Hiroshima) Kawanishi Works Shimadzu Seisakusho Buckton Corp.



FACILITIES FOR TEST MEASUREMENTS 測試設備

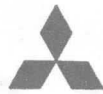
Classification	Name	Specification	Manufacturers
Apparatuses for Chemical Analysis 化學分析儀器	Coal and Petroleum Elements Analysing Equipments		
	Photo-electric Cell Spectrometer		
	Hydrogen Analysing Device		
	Oxygen Analysing Device		
	Gas Analysing Device		
	High Frequency Carbon & Sulfur Combustion Apparatus		
	Adiabatic Calorimeter		
Various Measuring Devices 各種測量裝置	Versatile High Temperature Microscope for Metals	with Photo Taking Attachment	Union Corp.
	Magnetic Oscillograph Strain Meter High Frequency Smelting Furnace Thickness Meter	Yokogawa N-6 Type Static & Dynamic Smelting Amount Electric Capacity 20 kVA TGIA	Yokogawa Shinko Tsushin Fuji Denpa Kogyo Kawasaki Iron Works

PRINCIPAL CRANES 主要的起重機

Classification	Name of Plant	Hoisting Capacity X Number of Cranes Reference (Unit Tons)
Machine Fabrication and Machining 機械製造廠用	Cast Steel Plant	30×2, 20×6, 15×1, 10×2
	Cast Iron Plant	40×1, 30×1, 25×1, 20×5, 15×4
	Pattern Plant	3×1
	Forging Plant	15×1
	Machine and Fabrication Plant	150×1, 100×1, 70×1, 50×4, 30×3, 25×1, 15×1, 10×3
	Tool Plant	3×1
Chemical Plants Division 化工廠用	Chemical Plants Factory	100×1, 50×1, 40×2, 30×4, 20×5, 15×2, 5×1
Marine Crane 船用起重機		300×, 40×1

Our Manufacturing Machinery for Iron & Steel
Sintering Equipment, Blast Furnaces, Mixer type Hot Metal Cars, Converters, Various Industrial Furnaces,

Various Rolling Mills, Various Sheet Treatment Lines, Gas Cleaning Equipment, Special Cranes for Iron Works.



BLAST FURNACES

高 爐

We are manufacturing and dealing the blast furnaces and sintering equipment under the technical license agreement with the Arthur G. McKee Co., U.S.A.

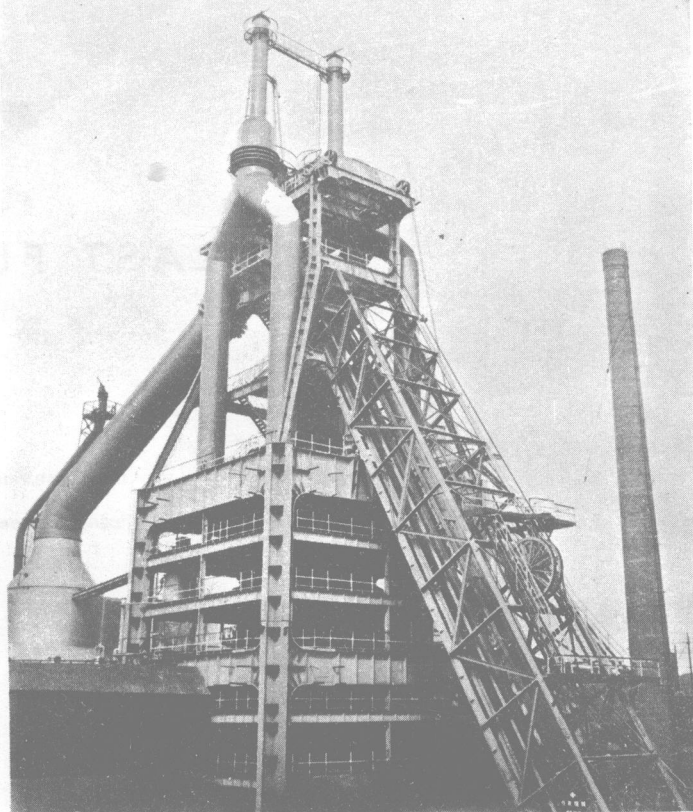
FEATURES :

1. Plant design with smallest construction area and highest efficiency.
2. Less initial and operational cost.
3. Easy to remodel ordinary blast furnace to the highest pressure type.
4. Both ring-girder type and free standing type available.
5. Complete gas sealed construction.
6. Easy maintainance owing to simple and robust structure.



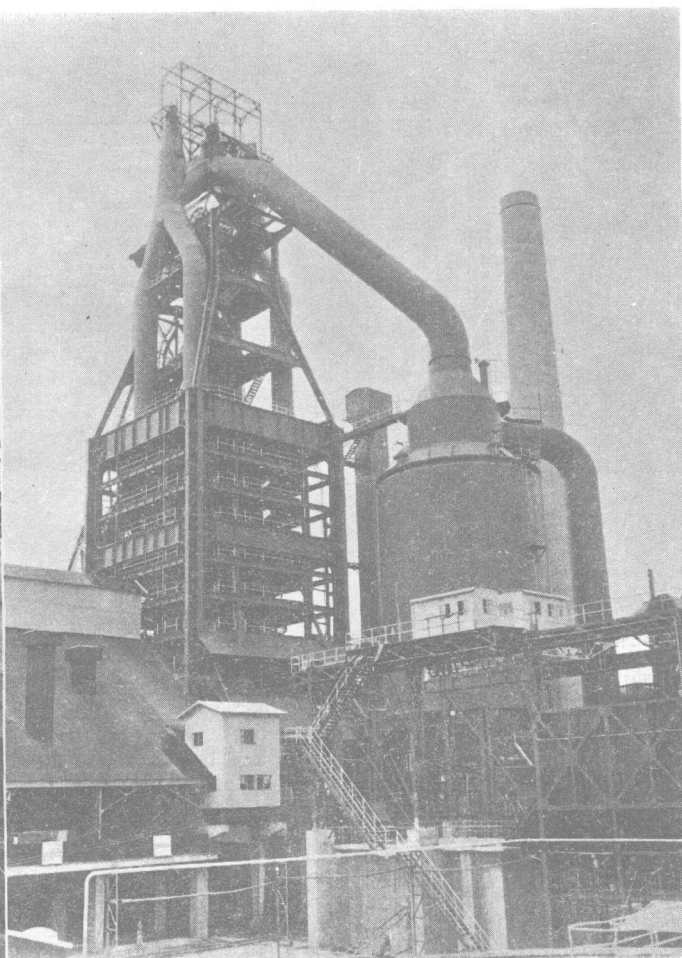
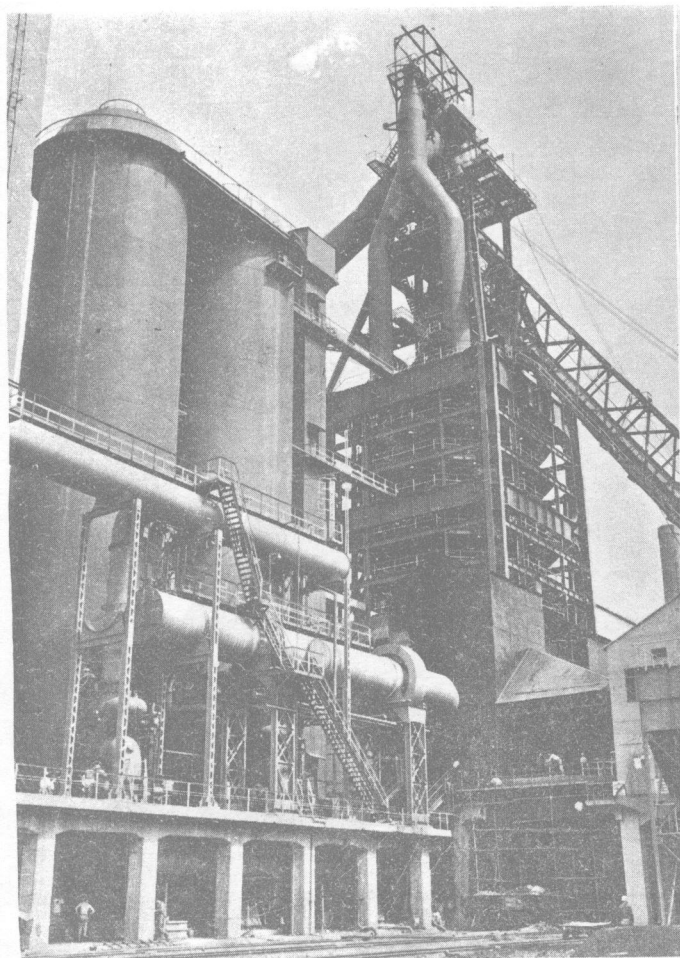


SKIP BRIDGE
裝料車



熱風爐及粗除塵器
STOVE and PRIMARY DUST CATCHER

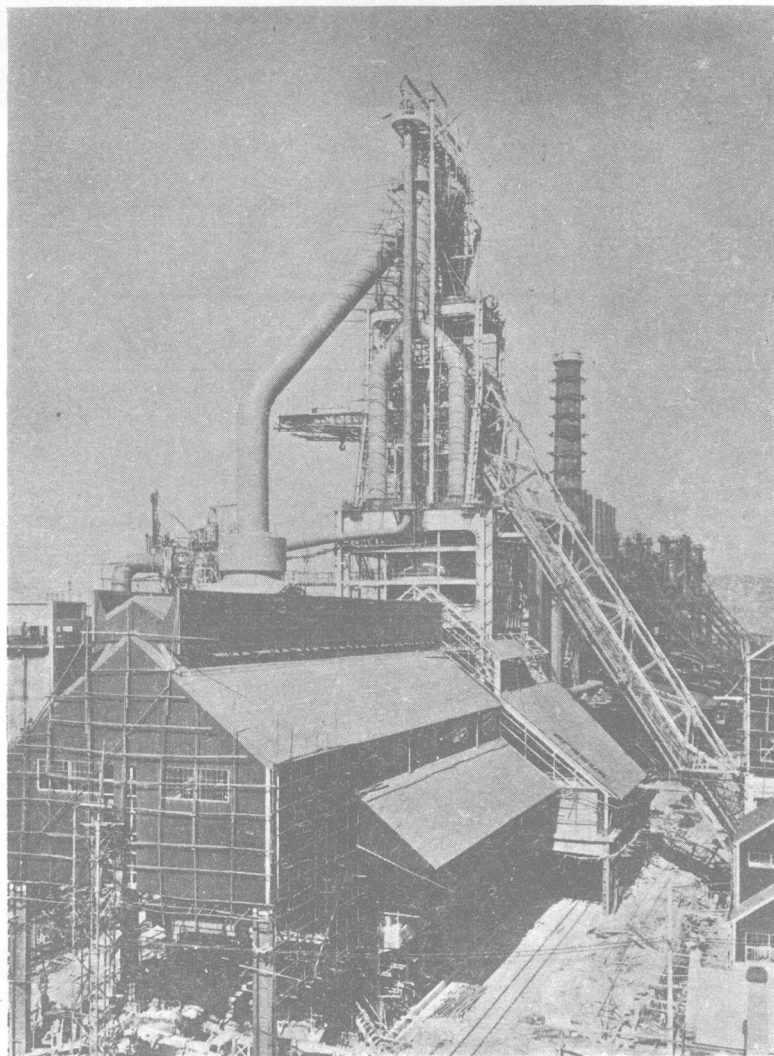
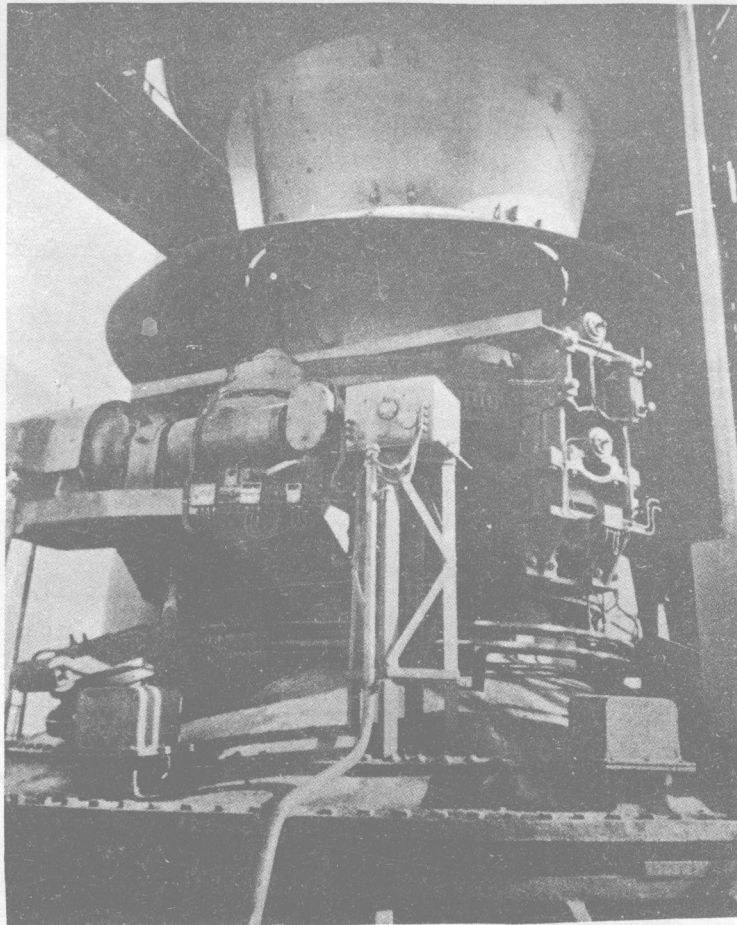
These are constructed by our long experience
and are capable of operating in its full capacity
under high temperature and pressure.



布料器 MCKEE DISTRIBUTOR

75% of the furnaces operating in Japan are equipped with this McKee type distributor.

This equipment is highly appreciated by its uniform raw material charging and durability.



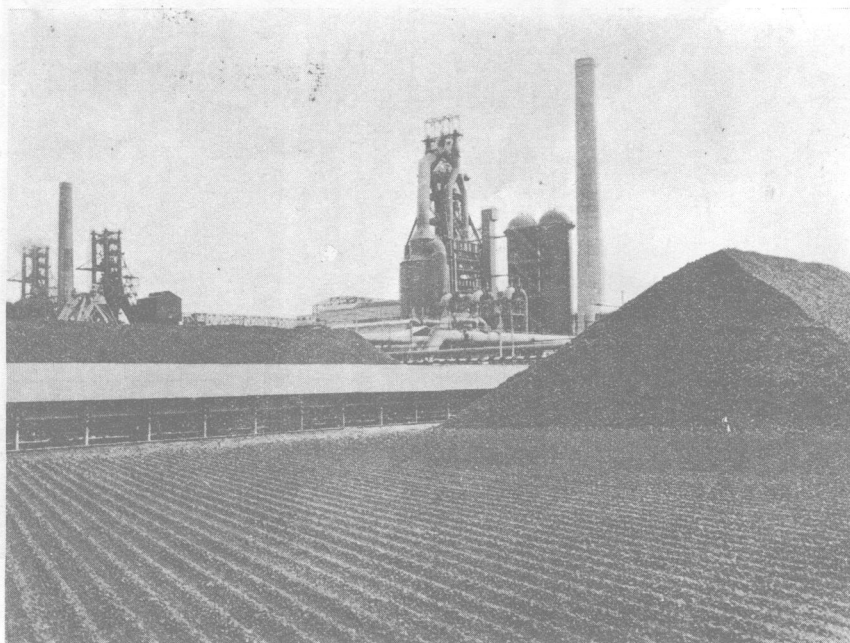
高壓爐頂高爐 HIGH TOP PRESSURE BLAST FURNACE

Recently high top pressure operation of blast furnaces are noticed for its higher productivity of pig iron.

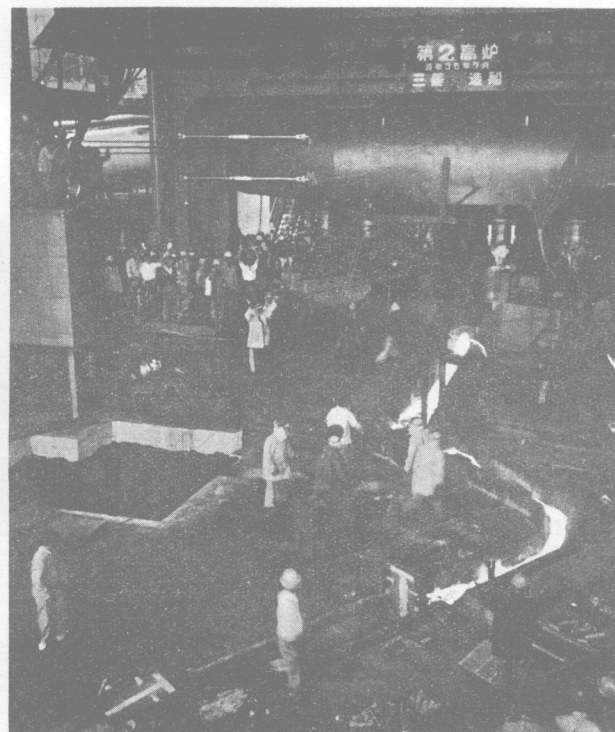
We have completed the first high top pressure 900 m³ blast furnace in Japan for Higashida Works of Yawata Iron & Steel Co. and are now constructing 2000 m³ high top pressure blast furnace for Tokai Iron & Steel Co.



堆礦場及高爐
ORE BEDDING & BLAST FURNACE



第一次出鐵
THE FIRST BLOWING OFF OF
SMELTING IRON



USERS OF OUR BLAST FURNACES 高爐用戶一覽表

Users	Capacity	Blast Furnace Number	Remarks
Nakayama Steel	500 tons/day	No. 2	Reconstruction
Shimura Chemical Industry	500 tons/day	No. 1	For Nickel ore
Fuji Steel (Hirohata)	1,000 tons/day	No. 2	Reconstruction
// (//)	1,000 tons/day	No. 1	Reconstruction
// (//)	1,500 tons/day	No. 3	
Nakayama Steel	500 tons/day	No. 2	Reconstruction
Fuji Steel (Muran)	2,000 tons/day	No. 4	
// (Hirohata)	1,000 tons/day	No. 2	
// (Kamaishi)	1,600 tons/day	No. 2	
Yahagi	250 m ³	No. 2	
Yawata (Higashida)	900 m ³	No. 1	High top pressure
Tokai	2,000 m ³	No. 1	High top pressure (under construction)

Our Manufacturing Machinery for Iron & Steel
Sintering Equipment, Blast Furnaces, Mixer type Hot
Metal Cars, Converters, Various Industrial Furnaces,

Various Rolling Mills, Various Sheet Treatment Lines,
Gas Cleaning Equipment, Special Cranes for Iron
Works.

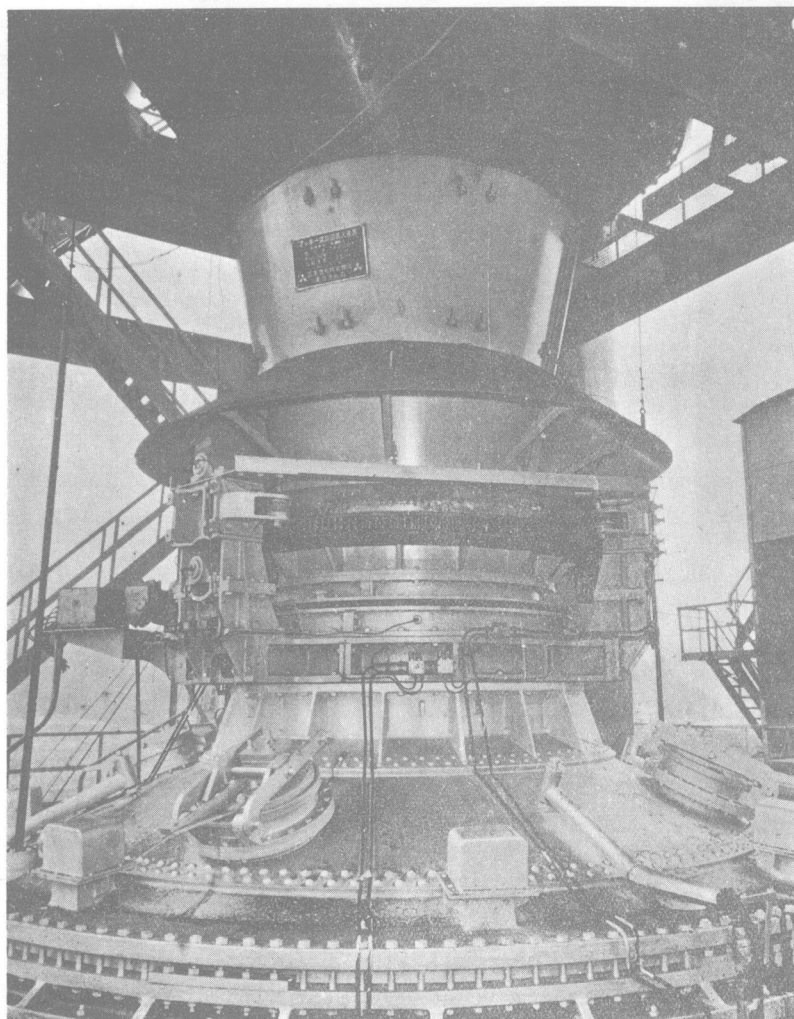


DISTRIBUTOR FOR BLAST FURNACE 高爐布料器

(McKee Top)

We have manufactured many distributors of various types and sizes for both domestic and foreign customers, under the technical license agreement with the Arther, G. McKee company, U.S.A.

This distributor is designed to charge raw materials uniformly in a blast furnace and contribute to the steady operation.



FEATURES :

1. No strain by thermal expansion
2. Complete gas sealing and simple construction.
3. Easy maintainance and easy replacement of parts.
4. Excellent durability by using high manganese cast steel for small bell and bell hopper.

MITSUBISHI SHIPBUILDING & ENGINEERING CO., LTD.