

Table V.1. Our Recent Products of Water Turbine Generators (over than 10,000 kVA)

Customer	Power Station	Output kVA	Voltage V	Speed r.p.m.	Type	No. of piece	Water turbine	Delivered year
Kansai E. P. Co.	Utsubo	30,000	11,000	200	V (u)	1	F	1953
Tohoku E. P. Co.	Kakkonda I	13,000	11,000	600	V	1	F	"
Hokuriku E. P. Co.	Jintsugawa II	23,500	11,000	200	V (su)	2	K	"
Kansai E. P. Co.	Tsunokawa	13,000	11,000	300	V (su)	1	K	1954
Hokuriku E. P. Co.	Jintsugawa III	11,000	11,000	100	V (u)	1	K	"
Tokyo E. P. Co.	Sudagai	24,000	11,000	250	V (su)	2	F	1955
"	Fujiwara	21,000	11,000	250	V (su)	1	F	1956
Fukui Pref.	Nakajima	11,000	11,000	600	V	2	F	"
Yamanashi Pref.	Nishiyama	10,800	11,000	600	V	2	F	"
Nippon Light Metal Co.	Motosu	13,000	6,600	720	V	1	P	"
Hokuriku E. P. Co.	Tochio	17,000	11,000	400	V	1	P	"
Electric Power Development Co.	Akiba I	30,000	11,000	200/167	V (u)	2	F	} Under Con- struction
"	Akiba II	41,000	11,000	180/150	V (su)	1	K	

Note: V—Vertical type V (u)—Vertical shaft umbrella type V (su)—Vertical shaft semi-umbrella type
 F—Francis turbine K—Kaplan turbine P—Pelton wheel

Table V.2. Our Recent Products of Diesel Generators (over than 500 kVA)

Customer	Output kVA	Voltage V	Speed r.p.m.	No. of pieces	Delivered year	Service
Omi Silk Mfg. Co.	500	3,300	400	1	1954	Land use
Ube Promoting Ind. Co.	625	3,300	600	2	"	"
Yokohama Gum Co.	625	3,300	514	1	"	"
"	560	3,300	600	1	"	"
Mitsubishi Ship Bldg.	687.5	450	360	3	1955	Marine use
Tohoku E. P. Co.	950	3,450	240	1	"	Land use
Bridge Stone Tyre Co.	500	3,300	600	1	"	"
Tokyo Gas Co.	1,250	3,450	333	1	"	"
Osaka Ship Bldg.	680	450	450	3	1956	Marine use
Nisshin Chem. Industry.	625	3,300	600	1	"	Land use
Taiyo Fishing Co.	687.5	450	600	3	"	Marine use

VI. DIRECT CURRENT MACHINES

VI.1. INTRODUCTION

Recently, our d.c. machines made surprising progress for all over the industries and especially in the iron and steel industry, we manufactured large electrical equipments one after another, which were planned for the First and Second Rationalization of Iron and Steel Industry in Japan, and they won always the admiration of customers on their excellent characteristics.

Fuji Control-dynamo (rototrol type) were used for the automatic control for these d.c. machines, to-

gether with the amplitrans or electronic amplifiers. Otherwise, it is our recent progress that the static Ward-Leonard System by the mercury arc rectifier is applied for all industries, especially in the iron and steel industry or paper making industry, as the d.c. source of these motors, before other makers.

As to the d.c. machines for marine services, the cargo winch, especially Ward-Leonard Winch, is most popular in our country because of the excellent characteristics and the light weight, and almost all winches of this type in Japan are supplied by us.

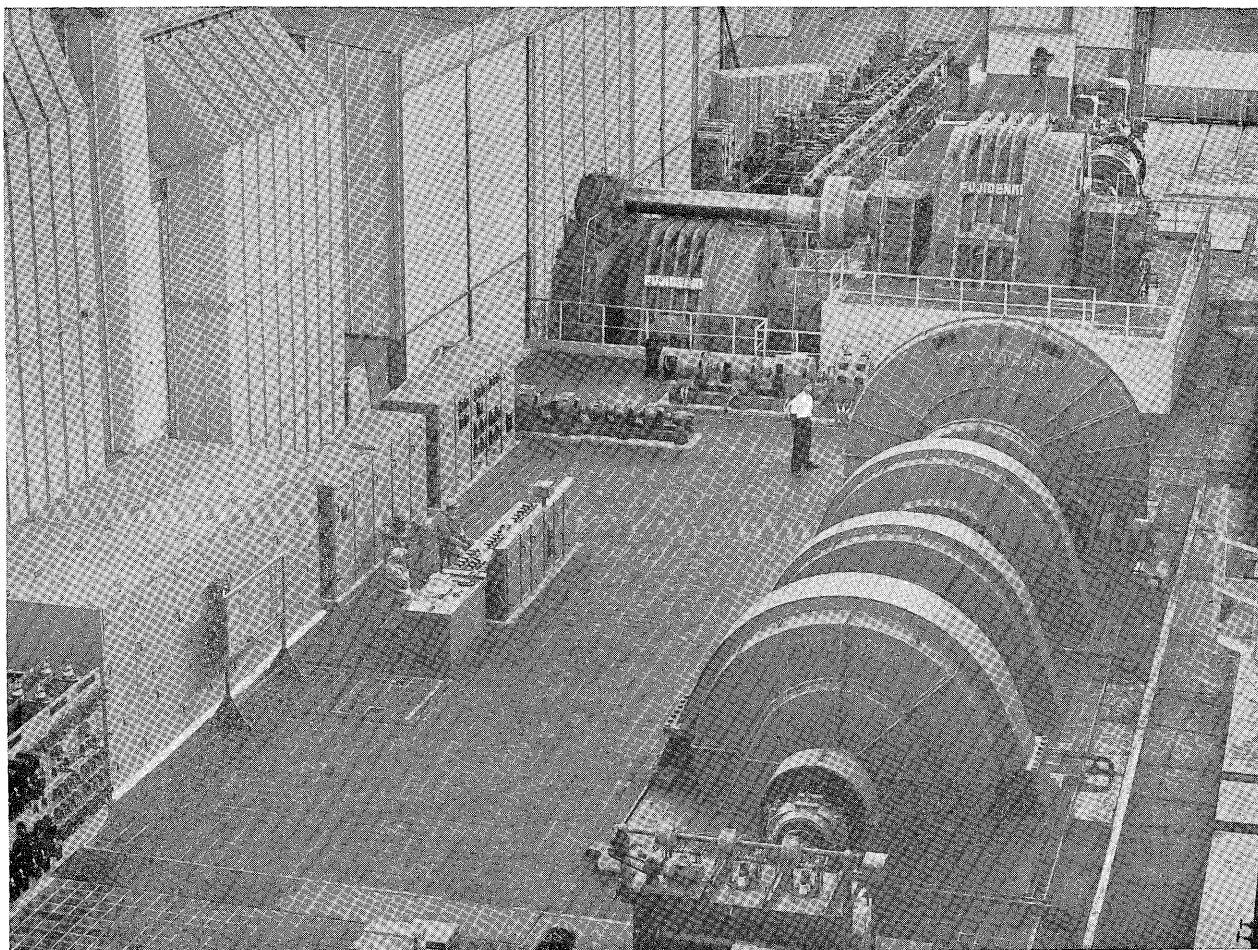


Fig. VI.1. $2 \times 3,500$ HP Ilgner Set for Blooming and Slabbing Mill of Kawasaki Iron Works

VI.2. STEEL MILL DEVELOPMENT

In 1953, we delivered 5,000 kW Ilgner set to $1,100 \times 2,400$ mm. blooming mill of Nihon Kokan K.K., that is the largest d.c. motor in Japan as single armature, and in 1954, 4,500 kW Ilgner set to $780 \times 2,200$ mm. rail mill of Yahata Iron Works. In the same year, we completed $2 \times 3,500$ HP Ilgner set for driving a $44'' \times 145''$ blooming and slabbing mill to Kawasaki Iron Works. It was the first twin drive system in our country. As the rototrols were used for the voltage controlling, field controlling, current limiting, load balancing and roll diameter compensating devices, so the mill can be reversed in 1.3 seconds from 40 r.p.m. in the forward direction to 40 r.p.m. in the reverse direction.

The hoop mill which was installed at Nihon Kokan K.K., in 1954, has the capacity of reducing the billet to the skelp of minimum 1.1 mm in thickness, maximum 400 mm in wide continuously, and the skelp is reeled as hoop.

This mill consists of five 1,200 HP, one 750 HP, one 300 HP, three 100 HP d.c. motors and five 1,200 HP, one 500 HP synchronous motors. All d.c. motors are fed by their own mercury arc rectifier.

The constant speed control of these motors was made by the grid control of mercury arc rectifier, using d.c. tacho-generator and electronic amplifier, and the loop regulator, also, was used at the finishing stand.

The new wire rod mill which was placed in operation at Kobe Steel Works in summer 1956, will roll out the rod of 5—13 mm diameter continuously with the speed of 1,500—480 meter per minute. For this mill, the electric power for nine 900 HP

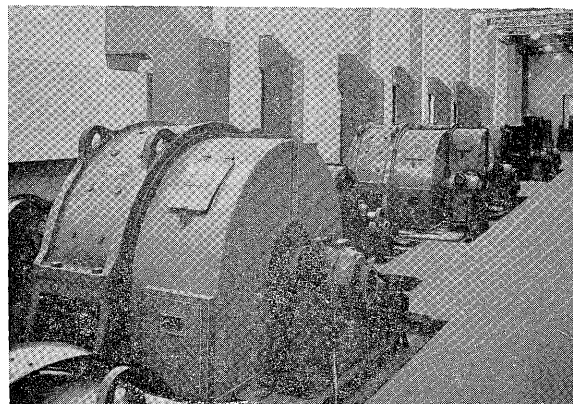


Fig. VI.2. D.c. Motors for Finishing Stand of Hoop Mill

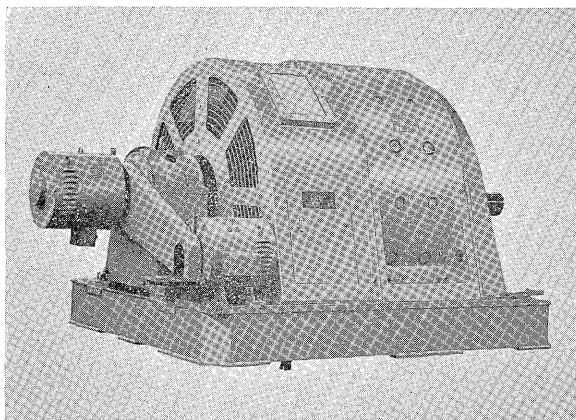


Fig. VI-3. 900 HP D.c. Motor for Wire Rod Mill of Kobe Steel Works

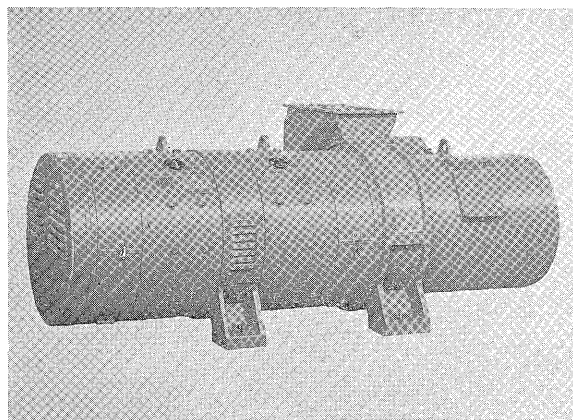


Fig. VI-4. M-G Set for Leonard Winch

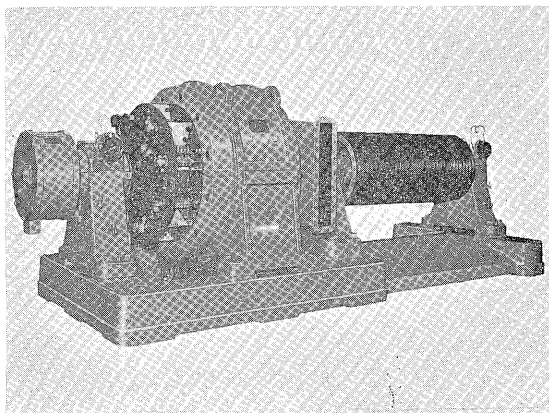


Fig. VI-5. 600 HP D.c. Motor for Paper Machine of Hokuetsu Seishi K.K.

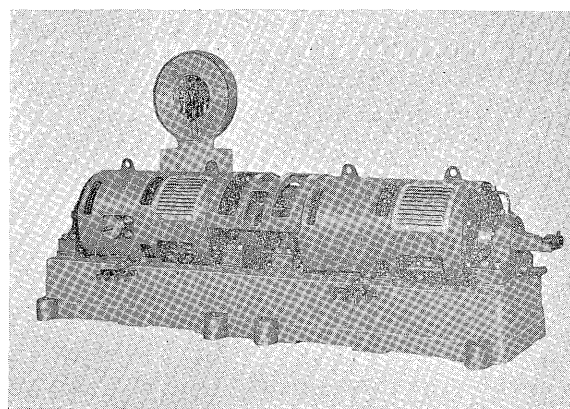


Fig. VI-6. 450 kW 6,500 r.p.m. Dynamometer for Testing Gas Turbine

main drive motors are supplied by three 1,000 kW and one 750 kW mercury arc rectifiers. The roughing stand is driven by two of above mentioned motors which share the load equally by a rototrol. To the three motors at intermediate stands and the four motors at finishing stands, the back-boost exciters are used to make the speed constant, and they are regulated by the electronic amplifiers which pick up the voltage reference between the standard and the tachometer-dynamo, overhung to the shaft end of each stand motors. The motors at the finishing stands are regulated by the signal of the photo cell loop regulators too.

As to hot strip mill, now we are manufacturing the electrical equipments for the 56" hot strip mill finishing train with 6 stands by the order of Kawasaki Iron Works.

This set has four 4,000 HP, one 3,500 HP d.c. motors (One 3,500 HP motor will be installed in future) and these motors are fed from the fifteen 1,050 kW mercury arc rectifiers. Comparing the voltage of the overhung tachometer-dynamo with the standard voltage, the difference, after suitable amplification by the amplitrans is used to control the back-boost exciter which will regulate the each stand motorfields. Thereby, the mill motors are kept in constant speed with high responsibility.

We are now also, making the whole electrical equipment for auxiliary drive, including the two hundred 3 HP d.c. runout table motors.

This equipment will be placed in operation in summer 1957.

VI-3. PAPER INDUSTRY

As driving motor of a paper machine, we had manufactured many d.c. motors for line shafting system. The speed of these motors were regulated precisely by rototrol or amplitrans, but in 1955, for a 600 HP motor, driving a 142" 1,000 ft/min paper machine in Hokuetsu Seishi K.K., we adopted static Leonard system by a mercury arc rectifier. The constant speed control of this motor were made by grid control of mercury arc rectifier, using a.c. pilot generator, electronic amplifier and amplitrans. The responsibility of this system were extraordinarily higher than that of the past rotating Leonard system. This static Leonard set for a paper machine was the first one in Japan, and rare even in the world. In 1956, we delivered a 300 HP d.c. motor of similar system for driving a 112" 800 ft/min paper machine to Jyujyo Works of Jyujyo Seishi K.K.

On the other hand, we are manufacturing a sectional driving equipment for a 142" 2,000 ft/min paper machine in Sakamoto Works of Jyujyo Seishi K.K.