

# THE BRITISH CORPORATION REGISTER OF SHIPPING AND AIRCRAFT

HEAD OFFICE — 14 BLYTHSWOOD SQUARE — GLASGOW

PARTICULARS OF TURBINE NO. 4393 AND GEARING NO. 4399 FOR THE  
REPORT ON THE CONSTRUCTION OF THE ENGINES, BOILERS AND AUXILIARY

## MACHINERY.

CP/MS/147/43. A/MS/M.376. Metropolitan Vickers No.110753/1.

### DESCRIPTION.

Two Cylinder Turbine Engine comprising an H.P. Ahead Turbine and an L.P. Ahead Turbine incorporating an H.P. Astern Turbine. The H.P. Ahead Turbine exhausts into the L.P. Ahead Turbine and this, and the H.P. Astern Turbine, exhaust into a Surface Condenser built integral with the L.P. Ahead and H.P. Astern Turbine Exhaust. The Turbines are coupled to Double Reduction Gearing.

Designed Service SHP - 6,800 at 116 R.P.M. - 15 Knots.

### TURBINES.

Makers - Metropolitan-Vickers Electrical Co. Ltd.  
No. of Sets 1 Works No. Engine No. 4393 (4394, 4395, 4396, 4397 and 4398).  
Type of Turbines - H.P. Ahead, Impulse - L.P. Ahead, Impulse - H.P. Astern, Impulse.  
Type of Gearing - Double Reduction.  
No. and Arrangement of Rotors - Two. Side by Side.

### ROTOR PARTICULARS.

<u>Name of Rotor.</u>	<u>H.P.</u>	<u>L.P.</u>
Ahead No. of Impulse Stages	13	8
" " " Rows of Blades per Stage	Stage 1 - 2 Rows Stages 2-13 - 1 Row	1
" S.H.P. of each Rotor	3350	3450
" R.P.M. of each Rotor	3969	2863
Astern No. of Impulse Stages	2	-
" " " Rows of Blades per Stage	Stage 1 - 2 Rows Stage 2 - 1 Row	-
" S.H.P. of each Rotor	3536	-
" R.P.M. of each Rotor	2294	-
Diameter of Rotor Shaft at Bearings.	5"	7"
No. and Length of Bearings	2 x 3 1/2"	2 x 6"
Span between bearing centres	5'-9"	7'-10 1/4"
Total S.H.P. Ahead at Main Shaft	6800 at 116-r.p.m.	
Total S.H.P. Astern " " "	3536 at 93-r.p.m.	

### Material of Casings.

H.P. Ahead and H.P. Astern Cylinders ... Cast Steel.  
L.P. Ahead Cylinder ... Mild Steel Plate (Fabricated).

### Material of Rotors.

H.P. Rotor ... Forged Steel B.E.A.M.A. Grade 3.  
L.P. Rotor ... " " " " 2.

Report on the construction of the engines, boilers and auxiliary Machinery (contd.)

- 2 -

Material of Nozzles.

H.P. Ahead	...	Stage 1 Stainless Steel.
L.P. Ahead	...	Stages 2-13, 1/2% Molybdenum Steel.
H.P. Astern	...	Stainless Steel.
		" "

Material of Blades.

H.P. Ahead Rotor	)	
L.P. " "	)	...
H.P. Astern " "	)	Stainless Steel.

Type of Glands	...	Nickel leaded bronze segmental rings with stepped serrations, spring supported in the gland casings, in conjunction with 3% Nickel Steel stepped sleeves on the Rotors.
----------------	-----	---

Type of Rotor Construction		H.P. Rotor machined from one forging. L.P. Rotor comprises a spindle with separate wheels, shrunk and keyed on.
----------------------------	--	---

Have Rotors been statically or dynamically balanced?		Yes, statically and dynamically.
--	--	----------------------------------

Have Rotors been overspeed tested?		Yes.
Type of Rotor Couplings		Claw.

What means are adopted for balancing axial thrust on Rotor?		Michell Block on H.P. & L.P. Rotors
---	--	-------------------------------------

Are arrangements such that steam can be lead direct to L.P. Turbine?		Yes.
--	--	------

Are arrangements such that either H.P. or L.P. Turbines can exhaust to Condenser?		Yes.
---	--	------

Condenser Type	...	Metropolitan-Vickers Electrical Co. Ltd.
Cooling Surface	...	6000 sq. ft.
No. of Tubes	...	2600
Material of Tubes	...	Aluminium Brass.

System of Lubrication		
Is a spare lubricating oil pump provided	...	Yes.

No. and diameter of Turbine Holding Down Bolts.	HP.Ford.	HP.Aft.	LP.Ford.	LP.Aft.
	6-1 1/2"	4-1.3/8"	10-1.3/4"	8-1 1/2"

REDUCTION GEARING.

Makers	.....	Metropolitan-Vickers Electrical Co. Ltd.	
No. of Sets..	1	Works No.4399 (4400, 4401, 4402, 4403 and 4404).	
Type of Gearing	-	Double Reduction Double Helical.	
Form of Tooth	- 1st Redn.	- All addendum, 22 1/2° n.p.a., 7/12" pitch.	
	2nd "	- Standard Involute, deep tooth, 14 1/2° n.p.a., 7/10" pitch.	
Gear Ratio	- 1st Redn.	H.P. 5.432:1	2nd Redn. 6.3:1
		L.P. 3.918:1	



Report on the construction of the engines, boilers and auxiliary machinery (contd.)

- 3 -

Speed at Pitch line	9792 ft./min.	3800 ft./min.
Pressure on tooth face	HP. 575 lbs./in. LP. 543 " "	HP. 780 lbs./in. LP. 735 " "

First Reduction Gearing Particulars.

Pinion driven by	one by H.P. Turbine	one by L.P. & Astern Turbine
Pinion R.P.M.	HP. 3969	LP. 2863
Pinion dia. of pitch circle.	9.4267"	13.0688"
Pinion Circular pitch	0.673064	0.673064
Pinion No. of teeth	44	61
Pinion width of face	20½"	20½"
Pinion Angle of Helix	29° - 58.87-min.	29° - 58.87-min.
Pinion dia. of Shaft	6"	7½"
Pinion No. of Bearings	2	2

Wheel R.P.M.	730
" dia. of pitch circle	51.2041
" No. of teeth	239
" dia. of shaft	11"
" No. of bearings	2
" Length of bearings	11"

Second Reduction Gearing Particulars.

Pinion driven by	First reduction wheels.
" R.P.M.	730
" dia. of pitch circle	19.7894"
" circular pitch	0.80740741
" No. of teeth	77
" Width of face	39"
" Angle of Helix	29° - 58.374-min.
" Dia. of Shaft	11"
" No. of bearings	2

Wheel R.P.M.	116
" dia. of pitch circle	124.6478
" No. of teeth	485
" dia. of shaft	17½"
" No. of bearings	2
" Length of bearings	17½"

Material of Pinions 3½ to 5% Nickel Steel Forged 40 tons U.T.S.  
 " " Wheels Rims 31/35 Tons Forged Steel.

Construction of Pinions (solid, built etc.) Solid  
 " " Wheels ( " " " ) First reduction Rim carried by Boiler Quality Plates bolted to flanged shaft.

Particulars of flexible or fluid couplings. Claw type couplings between rotors and pinions.  
 Material of Gear Case. ... M.S. Plate welded.  
 No. and dia. of holding down bolts 88 - 1½" dia.  
 No. of chocks, gear case ... 60

FORGINGS.

	<u>Forged By.</u>	<u>Material.</u>	<u>Finished By.</u>
Turbine Spindles.	H.P. Wm. Beardmore & Sons Ltd.	B.E.A.M.A. Grade III	Metropolitan-Vickers Elec. Co. Ltd.
	L.P. " "	B.E.A.M.A. Grade II.	" "

© 2021  
 Lloyd's Register  
 Foundation  
 0291 3/4

Report on the construction of the engines, boilers and auxiliary machinery (contd.)

- 4 -

Forgings (contd.)

	<u>Forged by.</u>	<u>Material.</u>	<u>Finished by.</u>
Turbine Wheels.	English Steel Corpn. Ltd.	45-ton Carbon Manganese Steel	Metropolitan-Vickers Elec. Co. Ltd.
Reduction Gear Shafts	" "	34/38-tons U.T.S.	"
Reduction Gear Wheels	" "	31/35 " "	"

Turbine Shaft diameter ...	5" H.P.	7" L.P.
Gearing " " ...	11"	
Main Gear Wheel Shadr dia .	17½"	Rule dia. 17.09"



© 2021

Lloyd's Register  
Foundation

0291 4/4