REPORT ON STEAM TURBINE MACHINERY.

Mdb. 17621. No. 18523

Date of writing Report 1/3/1944 When handed in at Local Office 3/3/1944 Port of West Hartlepool

No. in Reg. Book. Survey held at Hartlepool Date, First Survey 30th October, 1942 Last Survey 1st March 1944 (Number of Visits 102)

on the S/S "EMPIRE LAW" Tons Gross 8128 Net 4597

Built at Haverton Hill By whom built Furness S.B. Co Yard No. 357 When built 1944

Engines made at Hartlepool By whom made Richardsons Westgarth & Co Engine No. 2741 When made 1944

Boilers made at " By whom made " " " Boiler No. 2741 When made 1944

Shaft Horse Power at Full Power 6800 Owners Ministry of War Transport Port belonging to Middlesbrough.

Nom. Horse Power as per Rule (1215) 1210 for Shaft 475-20 Is Refrigerating Machinery fitted for cargo purposes No. Is Electric Light fitted Yes

Trade for which Vessel is intended

STEAM TURBINE ENGINES, &c.—Description of Engines Double Reduction Geared Turbines

No. of Turbines Ahead 2 Astern 1 ~~Direct coupled, single reduction geared~~ double reduction geared to one propelling shaft. No. of primary pinions to each set of reduction gearing 2

direct coupled to { Alternating Current Generator phase periods per second / Direct Current Generator } rated Kilowatts Volts at revolutions per minute;

for supplying power for driving Propelling Motors, Type

rated Kilowatts Volts at revolutions per minute. Direct coupled, single or double reduction geared to propelling shafts.

TURBINE BLADING.	H.P. HEIGHT OF BLADES.	H.P. DIAMETER AT TIP.	H.P. NO. OF ROWS.	I.P. HEIGHT OF BLADES.	I.P. DIAMETER AT TIP.	I.P. NO. OF ROWS.	L.P. HEIGHT OF BLADES.	L.P. DIAMETER AT TIP.	L.P. NO. OF ROWS.	ASTERN. HEIGHT OF BLADES.	ASTERN. DIAMETER AT TIP.	ASTERN. NO. OF ROWS.
1ST EXPANSION	1.23	17.46	7				7/8	39 3/4	3	Rotor { 4	49 1/2	1
2ND "	1.52	18.04	7				1.324	Cyl.	1	Rotor { 7	52 3/4	1
3RD "	1.68	18.36	6				1.896	Cone	1	Rotor { 9	55	1
4TH "	2.07	19.14	6				2.468	tapered	1			
5TH "	2.58	20.16	6				3.109	between	1	Impulse-blading		
6TH "	Above blading preceded						3.824	1st	1			
7TH "	by 2 row Impulse Wheel						4.539	&	1			
8TH "	as per particulars below						5.3	12th	1			
9TH "	1.715	30.47	1				6.13	expansion	1			
10TH "	1.68	31.69	1				7.047		1			
11TH "							8.185		1			
12TH "	NOTE all sizes in inches						9	56	1			

Rotor outlet

Shaft Horse Power at each turbine { H.P. 3500 / I.P. / L.P. 3300 } **Revolutions** per minute, at full power, of each Turbine Shaft { H.P. 3969 / I.P. / L.P. 2863 } 1st reduction wheel 731 / main shaft 116

Rotor Shaft diameter at journals { H.P. 5" / I.P. / L.P. 7" } **Pitch Circle Diameter** { 1st pinion L.P. 13.068" H.P. 9.426" / 2nd pinion 19.789" / 1st reduction wheel 51.204" / main wheel 124.647" } **Width of Face** { 1st reduction wheel 20 1/2" + 3 gap / main wheel 39" + 24 1/2" }

Distance between centres of pinion and wheel faces and the centre of the adjacent bearings { 1st pinion 10 1/8" / 2nd pinion 16 3/4" / 1st reduction wheel 2'-8 1/8" / main wheel 20" }

Flexible Pinion Shafts, diameter { 1st / 2nd } **Pinion Shafts,** diameter at bearings External / Internal 1st { 6", 7 1/2" / 1 1/2", 2 1/2" } 2nd { 11" / 5" } diameter at bottom of pinion teeth { 1st 8.91", 12.552" / 2nd 18.941" }

Wheel Shafts, diameter at bearings { 1st 11" / main 17 1/2" } diameter at wheel shroud, { 1st 3'-11" / main 9'-11 3/4" } **Generator Shaft,** diameter at bearings **Propelling Motor Shaft,** diameter at bearings

Intermediate Shafts, diameter as per rule 15.54" / as fitted 16" **Thrust Shaft,** diameter at collars as per rule 16.31" / as fitted 17"

Tube Shaft, diameter as per rule / as fitted **Screw Shaft,** diameter as per rule 17.04" / as fitted 17 3/4" Is the ~~tube~~ screw shaft fitted with a continuous liner Yes

Bronze Liners, thickness in way of bushes as per rule .821" / as fitted 7/8" Thickness between bushes as per rule .615" / as fitted 3/4" Is the after end of the liner made watertight in the propeller boss Yes If the liner is in more than one length are the junctions made by fusion through the whole thickness of the liner

If the liner does not fit tightly at the part between the bearings in the stern tube, is the space charged with a plastic material insoluble in water and non-corrosive

If two liners are fitted, is the shaft lapped or protected between the liners Is an approved **Oil Gland** or other appliance fitted at the after end of the tube shaft If so, state type Length of Bearing in **Stern Bush** next to and supporting propeller 5'-10"

Propeller, diameter 18'-0" Pitch Varying No. of Blades 4 State whether Moveable NO Total Developed Surface 121 square feet.

If **Single Screw,** are arrangements made so that steam can be led direct to the **L.P. Turbine** Yes Can the ~~**H.P.** or **I.P.**~~ **Turbine** exhaust direct to the Condenser Yes No. of Turbines fitted with astern wheels one **Feed Pumps** { No. and size 2-3" Turbo Feed Pumps (Weir's) / How driven Steam }

Pumps connected to the **Main Bilge Line** { No. and size 1-10"x9"x10" Fire & Bilge + 1-10"x9"x10" Ballast / How driven Steam }

Ballast Pumps, No. and size 1-10"x9"x10" **Lubricating Oil Pumps,** including Spare Pump, No. and size 2-9"x8"x18"

Are two independent means arranged for circulating water through the **Oil Cooler** Yes **Suctions,** connected to both Main Bilge Pumps and Auxiliary Bilge Pumps, No. and size:—In Engine and Boiler Room 4-3 1/2" E.R.B. Space, 1-2 1/2" tunnel well, 2-2 1/2" E.R.B. Space in Pump Room

In Holds, &c.

Main Water Circulating Pump Direct Bilge Suctions, No. and size 1-12" **Independent Power Pump Direct Suctions** to the Engine Room

Bilges, No. and size 1-5" Ballast Pump Are all the Bilge Suction pipes in Holds and Tunnel Well fitted with strum-boxes Yes

Are the Bilge Suctions in the Machinery Space led from easily accessible mud-boxes, placed above the level of the working floor, with straight tail pipes to the bilges Yes

Are all **Sea Connections** fitted direct on the skin of the ship Yes Are they fitted with Valves or Cocks both

Are they fixed sufficiently high on the ship's side to be seen without lifting the stokehold plates Yes Are the Overboard Discharges above or below the deep water line below

Are they each fitted with a Discharge Valve always accessible on the plating of the vessel Are the Blow Off Cocks fitted with a spigot and brass covering plate

What pipes pass through the bunkers none How are they protected

What pipes pass through the deep tanks Have they been tested as per rule

Are all Pipes, Cocks, Valves, and Pumps in connection with the machinery and all boiler mountings accessible at all times Yes

Is the arrangement of valves and their connections such as to prevent the possibility of water passing from the sea or from water tanks into the cargo or machinery spaces, or from one compartment to another Yes Is the Shaft Tunnel watertight Yes Is it fitted with a watertight door worked from

L.J. 22/3/44

BOILERS, &c.—(Letter for record ✓) Total Heating Surface of Boilers 6840 Sq ft ✓

Is Forced Draft fitted Yes ✓ No. and Description of Boilers 2 Foster Wheeler Watertube Working Pressure 480 lbs/in²

Is a Report on Main Boilers now forwarded? Yes ✓

Is { **a Donkey** / ~~an Auxiliary~~ } **Boiler fitted?** Yes ✓ (2) *If so, is a report now forwarded?* No

Is the donkey boiler intended to be used for domestic purposes only

Plans. *Are approved plans forwarded herewith for Shafting* 25/6/42 *Main Boilers* 18/6/42 *Auxiliary Boilers* ✓ *Donkey Boilers* ✓
(*If not state date of approval*)

Superheaters 22/7/42 *General Pumping Arrangements* 20/7/43 *Oil Fuel Burning Arrangements* 13/9/43

SPARE GEAR.

Has the spare gear required by the Rules been supplied

State the principal additional spare gear supplied

For RICHARDSONS, WESTGARTH & Co. LIMITED.
T. E. Armitage
DIRECTOR

The foregoing is a correct description, *Manufacturer.*

Dates of Survey while building

During progress of work in shops - - 1942. Oct 30. Nov 2.5.12. Dec 9.15.17.22. 1943. Jan 8.12. Feb 4.17.26. March 9.17.26. April 1.29. May 1.18.19.24.26. June 1.4.8.17.24.30. July 1.2.6.8.14.16.17.19.20.21. Aug 4.5.6.17.18.20 (9 intermediate date dates) 1944. Jan 5.6.7.19.21.25.31. Feb 2 3.4.7.9.14.15.16.21.23.25.29. Mar 1

During erection on board vessel - - -

Total No. of visits 102

Dates of Examination of principal parts—*Casings* 8.6.43 *Rotors* 9.6.43 *Blading* 14.7.43 *Gearing* 19.8.43

Wheel shaft 21.9.43 *Thrust shaft* 20.9.43 *Intermediate shafts* 13/12/43 *Tube shaft* ✓ *Screw shaft* 21.10.43

Propeller *Stern tube* 7.10.43 *Engine and boiler seatings* *Engine holding down bolts*

Completion of fitting sea connections *Completion of pumping arrangements* *Boilers fixed* *Engines tried under steam*

Main boiler safety valves adjusted *Thickness of adjusting washers*

Rotor shaft, Material and tensile strength Steel 34/38 *Identification Mark* 5856 6169, 5789 WA

Flexible ~~Pinion Shaft~~ Coupling, Material and tensile strength Stars 28/32 Sleeves 34/38 *Identification Mark* 1092 T.T.

Pinion shaft, Material and tensile strength nickel steel 40 *Identification Mark* J2390, J2387 WH

1st Reduction Wheel Shaft, Material and tensile strength nickel steel 40 *Identification Mark* 6505, 6857 WH

Wheel shaft, Material steel *Identification Mark* 8426 ERB *Thrust shaft, Material* steel *Identification Mark* 12513 HA

Intermediate shafts, Material steel *Identification Marks* 12934, 12398, 12305 HAI *Tube shaft, Material* ✓ *Identification Marks* ✓

Screw shaft, Material steel *Identification Marks* 12398 HAI *Steam Pipes, Material* S.D. steel ✓ *Test pressure* main. 1440 lbs aux. 540 lbs

Date of test 2/3/44 & various dates 6/10/43 to 1/11/43 *See* NOTT: CERT. C2188 *Is an installation fitted for burning oil fuel* Yes.

Is the flash point of the oil to be used over 150°F. Yes. ✓ *Have the requirements of the Rules for the use of oil as fuel been complied with* Yes.

Is the vessel (not being an oil tanker) fitted for carrying oil as cargo No. ✓ *If so, have the requirements of the Rules been complied with* ✓

If the notation for ice strengthening is desired, state whether the requirements in this respect have been complied with ✓

Is this machinery a duplicate of a previous case Yes ✓ *If so, state name of vessel* Rw. 2740

General Remarks (*State quality of workmanship, opinions as to class, &c.*)

The engines & boilers of this vessel have been constructed under Special Survey & in accordance with the approved plans & Specification.

The workmanship & material have been found good.

The machinery has been forwarded to Haverton Hill for fitting on board Messrs Furness S.B. Co. 357.

The machinery of this vessel will be eligible, in my opinion, to have recd. of +LMC - with date - on completion

Note:- Engine No 2743 allocated to this vessel & now re-numbered 2741

Certificate (if required) to be sent to

(The Surveyors are requested not to write on or below the space for Committee's Minute.)

The amount of Entry Fee	...	£ 6 : — :	When applied for,	
Special 4/5 LMC less 3 diums	...	£ 95 : 19 :	7	3/3/1944
Donkey Boiler Fee	...	£ : :	When received,	
~~Travelling Expenses (if any)~~ Supervision		£ 28 : 13 :	8	19

Clive Bell.
Engineer Surveyor to Lloyd's Register of Shipping.

Committee's Minute THURS 27 APR 1944

Assigned +LMC 4.44 FD CL