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R.C. No. 31572

REPORT ON REFRIGERATING MACHINERY AND APPLIANCES.

(Received at London Office

12 OCT 1928)

Date of writing Report

19

When handed in at Local Office

12 OCT 1928

Port of London

No. in

Reg. Book. Survey held at
90404Date: First Survey 10th February Last Survey 21st September 1928

(No. of Visits

15)

on the Refrigerating Machinery and Appliances of the "Highland Chieftain" Tons { Gross.....
Net.....

Vessel built at Belfast By whom built Harland & Wolff Ltd. Yard No. 806 When built 1928.

Owners Nelson Line Port belonging to Belfast Voyage

Refrigerating Machinery made by J. E. Hall Ltd. Machine No. 4623 When made 1928.

Insulation fitted by Metcalf Insulation Ltd. When fitted 1929. System of Refrigeration NH₃ + Brine

Method of cooling Cargo Chambers Brine Pipes Insulating Material used Granulated Cork & Shale Cotton.

Number of Cargo Chambers insulated 22 Total refrigerated cargo capacity 552,000 cubic feet.

DESCRIPTION OF REFRIGERATING MACHINERY. Where placed Green Deck over N^o 4 spaces.

Refrigerating Units, No. of two Single, double, or triple double Cubic feet of air delivered per hour

Total refrigeration or ice-melting capacity in tons per 24 hours 300 Are all the units connected to all the refrigerated chambers yes.

Compressors, driven direct ~~or through~~ ^{single} ~~double~~ ^{reduction gearing} Compressors, single or double acting Double No. of cylinders 2 per mach

Diameter of cylinders 11½" Diameter of piston rod 2¾" Length of stroke 15" No. of strokes per minute 360 each.

Motive Power supplied from Direct coupled. 4 cylinder oil engine

Steam Engines, high pressure, compound, or triple expansion, surface condensing. No. of cylinders - Diameter -

Length of stroke - Working pressure - Diameter of crank shaft journals and pins - 8"

Breadth and thickness of crank webs 10" x 5½" No. of sections in crank shaft one Revolutions of ~~engine~~ ^{NH₃ machine} per minute - 180

Oil Engines, type 2 or 4 stroke cycle ~~Single~~ ^{Double acting}

No. of cylinders - Diameter - Length of stroke - Span of bearings as per Rule

Maximum pressure in cylinders See separate report on oil engines Diameter of crank shaft journals and pins

Breadth and thickness of crank webs - No. of sections in crank shaft - Revolutions of engine per minute

Electric Motors, type - No. of - Rated - Kilowatts -

Volts at - revolutions per minute. Diameter of motor shafts at bearings -

Reduction Gearing, maximum shaft horse power at 1st pinion - Revolutions per minute at full power at 1st pinion -

2nd pinion - 1st reduction wheel - main shaft - Pitch circle diameter, 1st pinion - 2nd pinion -

1st reduction wheel - Main wheel - Width of face, 1st reduction wheel - Main wheel -

Distance between centres of pinion and wheel faces and the centre of the adjacent bearings, 1st pinion - 2nd pinion -

1st reduction wheel - Main wheel - Flexible pinion shafts, diameter 1st - 2nd -

Pinion shafts, diameter at bearings, External, 1st - 2nd - Internal, 1st - 2nd -

Diameter at bottom of teeth of pinion, 1st - 2nd - Wheel shafts, diameter at bearings, 1st -

Main - Diameter at wheel shroud, 1st - Main -

Gas Condensers, No. of 2 Cast iron or steel casings steel Cylindrical or rectangular rectangular

No. of coils in each 18. Material of coils S.D. Steel 1½" b x 4 S.W.G. Can each coil be readily shut off or disconnected yes.

Water Circulating Pumps, No. and size of 1 - " " "NH₃ condenser how worked elec. motor direct Gas Separators, No. of ea. comp. 1 suction

Gas Evaporators, No. of 2 Cast iron or steel casings steel Pressure or gravity type pressure

No. of coils in each casing 22 Material of coils S.D. Steel 1½" b x 4 S.W.G. Can each coil be readily shut off or disconnected yes.

Direct Expansion or Brine Cooled Batteries, No. of - Are there two separate systems, so that one may be in use while the other is being cleared of snow - No. of coils in each battery - Material of coils - Can each coil be readily shut off or disconnected - Total cooling surface of battery coils - Is a watertight tray fitted under each battery -

Air Circulating Fans, Total No. of - each of - cubic feet capacity, at - revolutions per minute -

Steam or electrically driven - Where spare fans are supplied are these fitted in position ready for coupling up -

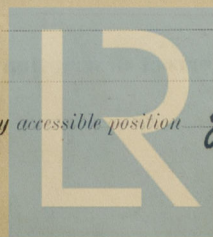
Brine Circulating Pumps, No. and size of, including the additional pump 4 vert. centri. for - - - - - elec. motor direct coupled

Brine Cooling System, closed or open closed. Are the pipes and tanks galvanised on the inside no.

No. of brine sections in each chamber see list attached.

Can each section be readily shut off or disconnected yes Are the control valves situated in an easily accessible position yes.

NOTE: THE WORDS WHICH DO NOT APPLY SHOULD BE DELETED.



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003088-003045-0233

Where the tanks are not closed is the compartment in which they are situated efficiently ventilated

Steam Condensing Plant. *State what provision is made for condensing steam, in terms of Section 4, Clauses 13 and 14*

HYDRAULIC AND OTHER TESTS.

Cooling Test. Has the refrigerating machinery been examined under full working conditions, and found satisfactory *Yes*

Dates of test *11th to 13th Jan 1929* Density of Brine *50°* by *Swadlow's* hydrometer

Temperatures (when the cargo chambers are cooled down to the required test temperatures) of air at the snow box and of the return air *—* & *—*, or, delivery and return air at direct expansion or brine cooled batteries *—* & *—*, outflow and return brine *-11°F* & *-7°F* atmosphere *39°F* cooling water inlet and discharge *41°F* & *47°F* gas in condensers *56°F* and evaporators *-11°F*

the average temperature of the refrigerated chambers *54°F* and the rise of temperature in these chambers upon the expiration of *18* hours

time after the machinery and cooling appliances have been shut off *6.11½* or *339° per hour*

SPARE GEAR.

ARTICLES REQUIRED BY RULES AND NOT YET SUPPLIED

The foregoing is a correct description of the Refrigerating Machinery.

FOR J. & E. HALL, LTD

Manufacturer.

Chickolson
for DIRECTOR

DESCRIPTION OF INSULATION.

IN LOWER HOLD CHAMBERS.						IN 'TWEEN DECK CHAMBERS.						
	Air Space.	Outer Lining.	Non-conducting Material.	Thickness of ditto.	Inner Lining.	Air Space.	Outer Lining.	Non-conducting Material.	Thickness of ditto.	Inner Lining.		
BULKHEADS.	FRAME No. 104 (Fore Peak)	✓	✓	Gran Cork	10"	2-3/4 bds.	✓	✓	Gran Cork	10"	2-3/4 bds.	
	FRAME No. 74	F	✓	✓	do	8 1/2"	do.	✓	✓	do.	4 1/2 to 5 1/2"	do.
		A	✓	✓	do	3 1/2"	do.	✓	✓	do.	3 1/2 to 4"	do.
	FRAME No. 48	F	✓	✓	do.	8 1/2"	do.	✓	✓	do.	4 1/2 to 6 1/2"	do.
		A	✓	✓	do.	3 1/2"	do.	✓	✓	do.	3 1/2 to 4"	do.
	FRAME No. 21	F	✓	✓	do.	8"	do.	✓	✓	do.	3 1/2 to 4"	do.
		A	✓	✓	do.	8"	do.	✓	✓	do.	3 1/2 to 4"	do.
	FRAME No. (Boiler Room)	F	✓	✓	do.	8"	do.	✓	✓	do.	3 1/2 to 4"	do.
		A	✓	✓	do.	8"	do.	✓	✓	do.	3 1/2 to 4"	do.
	FRAME No. 28 (Engine Room)	A	3"	1-1" bd	Sib. Cott.	8"	2-3/4 bds.	3"	1-1" bd	Sib. Cott.	8"	2-3/4 bds.
SIDES	FRAME No. 57	F	✓	✓	Gran Cork	3 1/2"	do.	✓	✓	Gran Cork	3 1/2 to 4"	do.
	FRAME No. 80	A	✓	✓	do.	7 1/2"	do.	✓	✓	do.	5 1/2 to 6 1/2"	do.
		F	✓	✓	do.	3 1/2"	do.	✓	✓	do.	3 1/2 to 4"	do.
	FRAME No.	A	✓	✓	do.	6 1/2"	do.	✓	✓	do.	4 1/2 to 5 1/2"	do.
		F	✓	✓	do.	6 1/2"	do.	✓	✓	do.	4 1/2 to 5 1/2"	do.
	FRAME No. 107 (After Peak)	F	✓	✓	Gran Cork	10"	2-3/4 bds.	✓	✓	Gran Cork	10"	2-3/4 bds.
		A	✓	✓	Gran Cork	6"	do.	✓	✓	Gran Cork	6"	do.
	OVERHEADING	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	FLOORS OF CHAMBERS	✓	✓	do.	6"	2-1/2 bds.	✓	✓	do.	6"	2-1/2 bds.	
	TRUNK HATCHWAYS	THRUST RECESS, SIDES AND TOP	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.
TUNNEL SIDES AND TOP		✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
TUNNEL RECESS, FRONT AND TOP		✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
FRAMES OR REVERSE FRAMES, FACE		✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
BULKHEAD STIFFENERS, TOP	RIBBAND ON TOP OF DECK	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	SIDE STRINGERS, TOP	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	WEB FRAMES, SIDES	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	BRACKETS, TOP	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
INSULATED HATCHES, MAIN	HATCHWAY COAMINGS, MAIN	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	HOLD PILLARS	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	MASTS	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	VENTILATORS	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Are insulated plugs fitted to provide easy access to bilge suction roses	Are insulated plugs fitted to provide easy access to bilge suction roses	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Are insulated plugs fitted to ventilators	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Are insulated plugs fitted to ventilators	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Are insulated plugs fitted to ventilators	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected	Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Oil Storage Tanks, where, adjacent to the insulated chambers, state what provision has been made for ventilating the air space between the insulation and the bulkhead plating	Oil Storage Tanks, where, adjacent to the insulated chambers, state what provision has been made for ventilating the air space between the insulation and the bulkhead plating	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Oil Storage Tanks, where, adjacent to the insulated chambers, state what provision has been made for ventilating the air space between the insulation and the bulkhead plating	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Oil Storage Tanks, where, adjacent to the insulated chambers, state what provision has been made for ventilating the air space between the insulation and the bulkhead plating	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Oil Storage Tanks, where, adjacent to the insulated chambers, state what provision has been made for ventilating the air space between the insulation and the bulkhead plating	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Coal Bunker Bulkheads, and Brine Outflow and Return Pipes passing through coal bunkers. Is the insulation, so far as practicable, fireproof	Coal Bunker Bulkheads, and Brine Outflow and Return Pipes passing through coal bunkers. Is the insulation, so far as practicable, fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Coal Bunker Bulkheads, and Brine Outflow and Return Pipes passing through coal bunkers. Is the insulation, so far as practicable, fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Coal Bunker Bulkheads, and Brine Outflow and Return Pipes passing through coal bunkers. Is the insulation, so far as practicable, fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Coal Bunker Bulkheads, and Brine Outflow and Return Pipes passing through coal bunkers. Is the insulation, so far as practicable, fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Where Cooling Pipes pass through watertight bulkheads or deck plating, are the fittings and packing of the stuffing boxes both watertight and fireproof	Where Cooling Pipes pass through watertight bulkheads or deck plating, are the fittings and packing of the stuffing boxes both watertight and fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Where Cooling Pipes pass through watertight bulkheads or deck plating, are the fittings and packing of the stuffing boxes both watertight and fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Where Cooling Pipes pass through watertight bulkheads or deck plating, are the fittings and packing of the stuffing boxes both watertight and fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Where Cooling Pipes pass through watertight bulkheads or deck plating, are the fittings and packing of the stuffing boxes both watertight and fireproof	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Cargo Battens, Dimensions and spacing, sides	Cargo Battens, Dimensions and spacing, sides	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Cargo Battens, Dimensions and spacing, sides	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Cargo Battens, Dimensions and spacing, sides	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Cargo Battens, Dimensions and spacing, sides	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Thermometer Tubes, No. and position in each chamber	Thermometer Tubes, No. and position in each chamber	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Thermometer Tubes, No. and position in each chamber	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Thermometer Tubes, No. and position in each chamber	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Thermometer Tubes, No. and position in each chamber	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Protection of Pipes. Are all pipes, including air and sounding pipes, which pass through or into insulated chambers, well insulated	Protection of Pipes. Are all pipes, including air and sounding pipes, which pass through or into insulated chambers, well insulated	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Protection of Pipes. Are all pipes, including air and sounding pipes, which pass through or into insulated chambers, well insulated	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Protection of Pipes. Are all pipes, including air and sounding pipes, which pass through or into insulated chambers, well insulated	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Protection of Pipes. Are all pipes, including air and sounding pipes, which pass through or into insulated chambers, well insulated	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Draining Arrangements. Where the chambers are situated below the load water line, what provision is made for draining the inside of the chambers	Draining Arrangements. Where the chambers are situated below the load water line, what provision is made for draining the inside of the chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Draining Arrangements. Where the chambers are situated below the load water line, what provision is made for draining the inside of the chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Draining Arrangements. Where the chambers are situated below the load water line, what provision is made for draining the inside of the chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Draining Arrangements. Where the chambers are situated below the load water line, what provision is made for draining the inside of the chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
What provision is made for draining the refrigerating machinery room	What provision is made for draining the refrigerating machinery room	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	What provision is made for draining the refrigerating machinery room	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	What provision is made for draining the refrigerating machinery room	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	What provision is made for draining the refrigerating machinery room	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
Are all air spaces behind insulation arranged to drain to the bilges, bilge wells, or gutterways of the respective chambers	Are all air spaces behind insulation arranged to drain to the bilges, bilge wells, or gutterways of the respective chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Are all air spaces behind insulation arranged to drain to the bilges, bilge wells, or gutterways of the respective chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Are all air spaces behind insulation arranged to drain to the bilges, bilge wells, or gutterways of the respective chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	
	Are all air spaces behind insulation arranged to drain to the bilges, bilge wells, or gutterways of the respective chambers	✓	✓	do.	9 1/2"	do.	✓	✓	do.	9 1/2, 10, 10 1/2"	do.	

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Sounding Pipes, No. and position in each chamber situated below the load water line 1 to each lower chamber at after end P.S. in No. 1, 2 & 3 } 12 in all.
Diameter 2 1/2" nominal bore Are all sounding pipes in way of insulated chambers fitted in accordance with Section 3, Clause 11 Yes.
Are all wood linings tongued and grooved Yes Are cement facings reinforced with expanded steel lattice Yes
How is the expanded metal secured in place Yes
How are the cork slabs secured to the steel structure of the vessel Yes
Air Trunkways in Chambers, inside dimensions, main Yes and branch Yes
Are they permanently fixed or collapsible, or portable Yes State position in chambers Yes
Where air trunkways pass through watertight bulkheads, are they fitted with watertight doors Yes Are the door frames efficiently insulated Yes
Are insulated plugs supplied for the doorways Yes Where are the doors worked from Yes
Cooling Pipes in Chambers, diameter 1 1/2" nominal bore Are they galvanised externally Yes
How are they arranged in the chambers on roof, ship's side & bulkheads.
Thawing Off, what provision is made for removing the snow from the cooling pipes in the chambers Circulation of warm brine.

The foregoing is a correct description of the Insulation and Appliances. For HARLAND AND WOLFF, LIMITED
Chas. Taylor Builders.

Plans. Are approved Plans or Specifications forwarded herewith for the Refrigerating Machinery 7.10.27 and Insulation 14.12.27.
Is the Refrigerating Machinery and Appliances duplicate of a previous case Yes If so, state name of vessel Highland Monarch
If the survey is not complete, state what arrangements have been made for its completion and what remains to be done Complete.

General Remarks (State quality of workmanship, opinions as to class, &c.) The refrigerating machinery has been constructed under special survey and the materials and workmanship are good.
The machinery has been efficiently installed and tested. A cooling down and an insulation test after 12 hours were made with satisfactory results. The vessel is now eligible, in my opinion, for record in Lloyd's R.M.C. with date.

PARTICULARS TO BE ENTERED IN REGISTER BOOK.

REFRIGERATING MACHINES.					System of (1) Refrigerating (2) Insulating the Chambers.	POWER.		INSULATED CARGO CHAMBERS.	
No. and whether Single or Duplex.	Makers.	Date of Construction.	System.	Type.		Cubic feet of air delivered per hour.	Ice melting capacity per 24 hours. Tons.	No.	Capacity.
2 double	J. E. Hall Ltd.	1928	Ammonia	Hall	(1) Bone (2) Green Ark Certificate Cotton		300	22	552,000

Fee (SPECIAL) £ 40.0.0 Lt. Bel. 12 OCT 1928
Travelling Expenses £ 2.9.2 Received by me 28.11.2-28/1/29 J. Rennie
Special Attendance £ 2.0.0 £ 16.0.0 - 4/3/29 J. Rennie
Committee's Minute FRI. 25 JAN 1929
Assigned