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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 90404 Date: 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
Vessel built at Belfast By whom built Harland & Wolff Ltd. Yard No. 806 When built 1928
Owners Nelson Steam Nav. Co. Ltd Port belonging to Belfast Voyage
Refrigerating Machinery made by J. E. Hall Ltd. Machine No. 4622 When made 1928
Insulation fitted by Mercury Insulation Co. Ltd. When fitted System of Refrigeration NH₃ + Brine
Method of cooling Cargo Chambers Brine Grids Insulating Material used Granulated Cork
Number of Cargo Chambers insulated 5 Total refrigerated cargo capacity 10,320 cubic feet.

DESCRIPTION OF REFRIGERATING MACHINERY. Where placed Green Deck over No. 4 Space.

Refrigerating Units, No. of one Single, double, or triple Single Cubic feet of air delivered per hour
Total refrigeration or ice-melting capacity in tons per 24 hours 21 Are all the units connected to all the refrigerated chambers

Compressors, driven direct or through reduction gearing Compressors, single or double acting double No. of cylinders one
Diameter of cylinders 4 1/2" Diameter of piston rod 1 3/4" Length of stroke 9" No. of strokes per minute 440

Motive Power supplied from Electric motor - direct coupled.

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 4 1/4"
Breadth and thickness of crank webs 6" x 2 3/4" No. of sections in crank shaft one Revolutions of engines per minute 220

Oil Engines, type 2 or 4 stroke cycle Single or double acting
No. of cylinders - Diameter - Length of stroke - Span of bearings as per Rule -
Maximum pressure in cylinders - 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 Enclosed ventilated No. of one Rated 40 BHP Kilowatts
Volts 220 at 220 revolutions per minute. Diameter of motor shafts at bearings 4" driving end, 3 1/2" other end.

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 one Cast iron or steel casings steel Cylindrical or rectangular cylindrical
No. of coils in each 6 Material of coils S.D. Steel 1" b x 1 5/16" o.d. Can each coil be readily shut off or disconnected yes

Water Circulating Pumps, No. and size of one vert. centri. how worked electrically Gas Separators, No. of 1 suction

Gas Evaporators, No. of one Cast iron or steel casings steel Pressure or gravity type pressure.
No. of coils in each casing 3 Material of coils S.D. Steel 1 1/4" 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 one vert. centri. how worked electrically
Brine Cooling System, closed or open closed Cross connected to main brine system Are the pipes and tanks galvanised on the inside no.

No. of brine sections in each chamber No. 1 meat = 2, No. 2 meat = 2, vegetables = 1
Fish + Poultry = 2, milk + Butter = 1, Ice tank = 1, Cupboards + Water Coolers = 2
Can each section be readily shut off or disconnected yes Are the control valves situated in an easily accessible position yes

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Are thermometers fitted to the outflow and to each return brine pipe yes Where the tanks are closed are they ventilated as per Rule

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.

DESCRIPTION.	Date of Test.	Working Pressure.	Hydraulic Test Pressure.	Air Test Pressure.	Stamped.	REMARKS.
ENGINE CYLINDERS (IF TESTED)	13-9-28					
GAS COMPRESSORS	4-6-28	150 lbs sq in	400 lbs sq in			
SEPARATORS	13-9-28					
CONDENSER COILS	14-9-28	do.	1500 lbs sq in	500 lbs sq in	OK	
EVAPORATOR COILS	18-5-28	do.	do.	do.	OK	
CONDENSER HEADERS AND CONNECTIONS	5-9-28	do.	do.	do.	OK	
CONDENSER CASINGS	21-9-28	5 lbs sq in	20 lbs sq in	-	OK	
EVAPORATOR CASINGS	19-9-28	Brine Suction	20 lbs sq in	-	OK	
NH ₃ CONDENSER, EVAPORATOR AND AIR COOLER COILS AFTER ERECTION IN PLACE						
BRINE PIPING AFTER ERECTION IN PLACE						

Cooling Test. Has the refrigerating machinery been examined under full working conditions, and found satisfactory Yes
 Dates of test 9th + 10th January 1929 Density of Brine 58° by J. Swaddell'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. 3° F & 1° F
 atmosphere 44° F cooling water inlet and discharge 40° F & 43° F gas in condensers 47° F and evaporators -13° F
 the average temperature of the refrigerated chambers 12.6° F and the rise of temperature in these chambers upon the expiration of 12 hours
 time after the machinery and cooling appliances have been shut off 7° F = 508° per hour

SPARE GEAR.

ARTICLES SUPPLIED AS PER RULE.	ADDITIONAL SPARE GEAR SUPPLIED.
1 crankshaft. 1 pair main bearing brasses with bolts & nuts. 1 pair crank pin brasses with bolts & nuts. 1 pair X-head brasses with bolts & nuts. 30 brass liners different sizes for each size bearing. 1 compressor front cover & back cover. 1 compressor piston rod with rings complete. 1 complete set suction and delivery valves, cages, springs & seals for each size pipe. 1 complete set of packing for compressor gland. 1 complete set of packing for brine and water pumps. 1 glass for NH ₃ gland lubricator. 2 flanges for each size NH ₃ pipe. 1 NH ₃ regulating valve & spindle complete. 1 impeller & spindle C.W. pump. 1 set bearings do brine pump. 1 do do C.W. pump. 1 set brushes C.W. pump. 1 do do brine pump.	1 spring for water relief valve 1 NH ₃ coil + shut off valve for condenser. 1 NH ₃ coil + shut off valve for evaporator 1 pinion

ELECTRICAL SPARES.

one set carbon brushes
 one half set of brush springs
 Controller for motor.
 No-volt coil
 Blow out coil
 Set of fuses, drum contacts
 Set top & bottom contacts etc.

Machine motor
 Circulating water pump motor
 Brine pump motor.

ARTICLES REQUIRED BY RULES AND NOT YET SUPPLIED

The foregoing is a correct description of the Refrigerating Machinery.

FOR J. & E. HALL, LTD
 Chichester
 MANUFACTURER.

DESCRIPTION OF INSULATION.

	IN LOWER HOLD CHAMBERS.					UPPER IN BETWEEN DECK CHAMBERS, FOOT SIDE FRAMES OF IS 36 F				
	Air Space.	Outer Lining.	Non-conducting Material.	Thickness of ditto.	Inner Lining.	Air Space.	Outer Lining.	Non-conducting Material.	Thickness of ditto.	Inner Lining.
FRAME NO. (Fore Peak)	A									
FRAME NO. 36 F	F									
No 2 Meat Room	A					nil	nil	Gran Lark	9"	3/4" TRG
FRAME NO. 29 F	F									
No 1 Meat Room	A					"	3/4" TRG	do	7"	3/4" TRG
FRAME NO. 21 F	F					"	✓	do	9"	do
BRINE ROOM	A					"	✓	do	3"	do
FRAME NO. (Boiler Room)	F									
FRAME NO. (Engine Room)	A									
FRAME NO. 18 F	F					"	✓	do	3"	do
Vegetable Room	A					"	✓	do	9"	do
FRAME NO. 12	F									
Fish & Poultry Room	A					"	3/4" TRG	do	7"	do
FRAME NO. 15	F									
Milk & Butter Room	A					"	1 1/2" TRG	do	9"	3/4" TRG
FRAME NO. 6 F	F									
(After Peak)										
SIDES of Sumps						3"	1" TRG	do	9"	do
" " Alleyway.						nil	nil	do	10"	do
OVERHEADING						nil	1/2" TRG	do	9"	do
FLOORS OF CHAMBERS										
						1 1/2" asphalt in No 1 & 2 Meat Rooms				
						5" slab work & 1 1/2" asphalt in Veg. & Fish Rooms				
TRUNK HATCHWAYS										
THRUST RECESS, SIDES AND TOP										
TUNNEL SIDES AND TOP										
TUNNEL RECESS, FRONT AND TOP										
FRAMES OR REVERSE FRAMES, FACE						3" cork				
BULKHEAD STIFFENERS, TOP										
BOTTOM										
AND FACE										
RIBBAND ON TOP OF DECKS										
SIDE STRINGERS, TOP										
BOTTOM										
AND FACE										
WEB FRAMES, SIDES										
AND FACE										
BRACKETS, TOP										
BOTTOM										
AND FACE										
INSULATED HATCHES, MAIN										
BILGE										
MANHOLE										
HATCHWAY COAMINGS, MAIN										
BILGE										
HOLD PILLARS										
MASTS										
VENTILATORS										
Are insulated plugs fitted to provide easy access to bilge suction roses										
tank, air, and sounding pipes										
heels of pillars										
and manhole doors of tanks										
Are insulated plugs fitted to ventilators										
cargo ports										
and side lights										
Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected										
if so, how										
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										
Coal Bunker Bulkheads, and Brine Outflow and Return Pipes passing through coal bunkers. Is the insulation, so far as practicable, fireproof										
Where Cooling Pipes pass through watertight bulkheads or deck plating, are the fittings and packing of the stuffing boxes both watertight and fireproof										
Cargo Battens, Dimensions and spacing, sides										
Screens										
floors										
3-1/2 gratings										
tunnel top										
fixed or portable										
portable										
Are screens fitted over the brine grids at chamber sides										
Yes										
hinged or permanently fixed										
portable										
Thermometer Tubes, No. and position in each chamber										
One in centre overhead in each chamber.										
diameter										
2 1/2" internal										
are they fitted in accordance with Section 3, Clause 8										
Yes										
Protection of Pipes. Are all pipes, including air and sounding pipes, which pass through or into insulated chambers, well insulated										
Yes										
Draining Arrangements. Where the chambers are situated below the load water line, what provision is made for draining the inside of the chambers										
Brine trap with an overflow valve discharging overboard with steam valve										
Where sluices, scupper pipes, and drain pipes are fitted are means provided for blanking them off										
No										
What provision is made for draining the refrigerating machinery room										
✓										
brine return room										
2 1/2" sluffe overboard with steam valve										
fan room										
water circulating pump room										
Are all air spaces behind insulation arranged to drain to the bilges, bilge wells, or gutterways of the respective chambers										

Sounding Pipes, No. and position in each chamber situated below the load water line

Diameter _____ Are all sounding pipes in way of insulated chambers fitted in accordance with Section 3, Clause 11

Are all wood linings tongued and grooved Yes Are cement facings reinforced with expanded steel lattice

How is the expanded metal secured in place _____

How are the cork slabs secured to the steel structure of the vessel _____

Air Trunkways in Chambers, inside dimensions, main _____ and branch _____

Are they permanently fixed or collapsible, or portable _____ State position in chambers _____

Where air trunkways pass through watertight bulkheads, are they fitted with watertight doors _____ Are the door frames efficiently insulated _____

Are insulated plugs supplied for the doorways _____ Where are the doors worked from _____

Cooling Pipes in Chambers, diameter 1 1/2" internal Are they galvanised externally Yes

How are they arranged in the chambers On overheads and 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.

Chastayne 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 test and an insulation test after 18 hours were made with satisfactory results. The vessel is now eligible, in our opinion, for record to LLOYD'S R.M.C. with date.

PARTICULARS TO BE ENTERED IN REGISTER BOOK.

REFRIGERATING MACHINES.					POWER.		INSULATED CARGO CHAMBERS.		
No. and whether Single or Duplex.	Makers.	Date of Construction.	System.	Type.	(1) Refrigerating (2) Insulating the Chambers.	Cubic feet of air delivered per hour.	Ice melting capacity per 24 hours. Tons.	No.	Capacity.
1 Single	J. & E. Hall Ltd.	1928	Ammonia	Hall	(1) Brine (2) Fan Coil		21	5	10,320

Fee £ 6 : 0 : 0 (See Report on Machinery 7623/4) Received by me, 12 OCT 1928

Committee's Minute FRI. 25 JAN 1929

Assigned

Lloyd's R.M.C. 1.29 gwh

Jas Rennie

D. Gemmell Surveyor to Lloyd's Register.
See also on main Co. install

CERTIFICATE WRITTEN



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Certificate to be sent to Bel 29/1/29

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