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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  
90404Date: First Survey 10<sup>th</sup> February Last Survey 21<sup>st</sup> 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 &amp; 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

Mersey Insulation Co. Ltd

When fitted

System of Refrigeration NH<sub>3</sub> + 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

gearing

reduction gearing

Compressors, single or double acting

double

No. of cylinders

one

Diameter of cylinders

4½"

Diameter of piston rod

1¾"

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

4½"

Breadth and thickness of crank webs

6" x 2¾"

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, 3½" 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 1½" 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 delivery

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 1¼" 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

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 cooler = 2

Can each section be readily shut off or disconnected

yes

Are the control valves situated in an easily accessible position

yes



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. "meat"	400 lbs. "			
" SEPARATORS	13-9-28					
" CONDENSER COILS	14-9-28	do.	1500 lbs. "	500 lbs. "	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. "	20 lbs. "	-	OK	
" EVAPORATOR CASINGS	19-9-28	Brine Suction	20 lbs. "	-	OK	
NH <sub>3</sub> 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 9<sup>th</sup> + 10<sup>th</sup> January 1929 Density of Brine 58° by 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

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°F 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 and 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 & NH<sub>3</sub> coil + shut off valve for condenser.  
1 complete set of packing for compressor gland.  
1 complete set of packing for brine and water pumps.  
1 glass for NH<sub>3</sub> gland lubricator.  
2 flanges for each size NH<sub>3</sub> pipe.  
1 NH<sub>3</sub> regulating valve & spindle complete.  
1 impeller & spindle C.W. pump.  
1 set do do brine pump.  
1 set do do C.W. pump.  
1 set brushes C.W. pump.  
1 do do brine pump.  
1 do do C.W. pump.  
1 do do brine pump.

1 spring for water relief valve  
1 NH<sub>3</sub> coil + shut off valve for condenser.  
1 NH<sub>3</sub> 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

Manufacturer.

Chichester

W. H. HALL

### DESCRIPTION OF INSULATION.

IN LOWER HOLD CHAMBERS.						UPPER IN BETWEEN DECK CHAMBERS. PORT SIDE FRAMES OF 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 Cork	9"	3/4" T.G.
FRAME No. 29 F	F									
No 1 Meat Room	A					"	3/4" T.G.	do	7"	3/4" T.G.
FRAME No. 21 F	F					"	✓	do	9"	do
FRAME No. 21 F	A					"	✓	do	3"	do
BRINE ROOM	F									
FRAME No. (Boiler Room)	A									
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" T.G.	do	7"	do
FRAME No. 15	F									
Milk & Butter Room	A					"	1 1/4" T.G.	do	9"	3/4" T.G.
FRAME No. 6 F	F									
(After Peak)	F									
SIDES of Ship						3"	1" T.G.	do	9"	do
" " " " " "						nil	nil	do	10"	do
" " " " " "						nil	1/2" T.G.	do	9"	do
OVERHEADING									11"	do
FLOORS OF CHAMBERS						1 1/2" asphalt in No 1 & 2 Meat Rooms				
						5" slab work & 1 1/2" asphalt in Fish, Vegetable & Milk & Butter 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 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 return room 2 1/2" supplied overhead with tank valve

What provision is made for draining the refrigerating machinery room

Are all air spaces behind insulation arranged to drain to the bilges, bilge wells, or gutterways of the respective chambers

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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)					12 OCT 1928			
Travelling Expenses					Received by me, 19			
Committee's Minute					FRI. 25 JAN 1929			
Assigned					+ Lloyd's R.M.C. 1.29			

CERTIFICATE WRITTEN



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