

REPORT ON REFRIGERATING MACHINERY AND APPLIANCES.

(Received at London Office)

Date of writing Report 24 AUG 1934

When handed in at Local Office 24 AUG 1934

Port of London

No. in

Reg. Book. Survey held at

Date: First Survey 28 February

Last Survey 19 July 1934

(No. of Visits)

on the Refrigerating Machinery and Appliances of the T.S.M.V. "DURHAM" Tons { Gross 10893 Net 6261

Vessel built at Belfast By whom built Workman Clark & Co. Yard No. 533 When built 1934

Owners Federal Steam Navigation Co. Ltd. Port belonging to London Voyage

Refrigerating Machinery made by J. E. Hall Ltd. Machine No. 8993 8994 8995 When made 1934

Insulation fitted by Messrs Insulation Co. Ltd. When fitted 1934 System of Refrigeration

Method of cooling Cargo Chambers Brine Grids + Air Circ. Insulating Material used Gran. Cork + Cotton Spherals

Number of Cargo Chambers insulated 19 Total refrigerated cargo capacity 497.625 cubic feet.

DESCRIPTION OF REFRIGERATING MACHINERY. Where placed Lower Deck fore of E.R. Casings

Refrigerating Units, No. of 3 Single, double, or triple - Cubic feet of air delivered per hour

Total refrigeration or ice-melting capacity in tons per 24 hours 168 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 single No. of cylinders 6

Diameter of cylinders 5" Diameter of piston rod 2 1/4" Length of stroke 10" No. of strokes per minute 300 each

Motive Power supplied from Electric motors, 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 6 1/2" journals, 4" pins

Breadth and thickness of crank webs 9" x 4 1/2" No. of sections in crank shaft one Revolutions of engines per minute 300

Oil Engines, type - 2 or 4 stroke cycle - Single or double acting - B.H.P. -

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 open - drip proof canopy No. of 3 Rated 160 BHP Kilowatts

Volts at 220 v 200/300 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 3 Cast iron or steel casings cast iron Cylindrical or rectangular cylindrical

No. of coils in each 14 Material of coils S.D. Copper 3/4" b. x 1" d. Can each coil be readily shut off or disconnected yes

Water Circulating Pumps, No. and size of 2 - 4" vert. centri. how worked Elec. direct coupled Gas Separators, No. of 6

Gas Evaporators, No. of 3 Cast iron or steel casings steel Pressure or gravity type pressure

No. of coils in each casing 14 Material of coils S.D. Steel 1" b. x 1 1/2" d. Can each coil be readily shut off or disconnected yes

Direct Expansion or Brine Cooled Batteries, No. of A - 2 B - 1 C - 1 D - 4 Are there two separate systems, so that one may be in use while the other is being

cleared of snow no No. of coils in each battery A - 10 B - 12 C - 10 D - 2 Material of coils A - 1 1/2" b. S.D. Steel B - 1 1/2" b. S.D. Steel C - 1 1/2" b. S.D. Steel D - 1 1/2" b. S.D. Steel Can each coil be readily shut off or

disconnected yes Total cooling surface of battery coils A+B+C+D = 11,600 sq. ft. D = 800 sq. ft. is a watertight tray fitted under each battery yes

Air Circulating Fans, Total No. of 4 - 4 1/2" each of 32,000 4,000 600 10,000 cubic feet capacity, at 2300 1600 1300 revolutions per minute

Steam or electrically driven Electrically driven Where spare fans are supplied are these fitted in position ready for coupling up no

Brine Circulating Pumps, No. and size of, including the additional pump 1 - 4" x 4 1/2" V.D. ram how worked elec. thro worm gearing

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 separate list attached

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 Yes
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)						
GAS COMPRESSORS	25-4-34	1000 lbs \square	3000 lbs \square	1500 lbs \square	OK	
SEPARATORS	20-4-34	do.	do.	do.	OK	
CONDENSER COILS	4-3-34, 24-3-34, 4-4-34	do.	do.	do.	OK	
EVAPORATOR COILS	16-3-34, 24-3-34, 9-4-34	do.	do.	do.	OK	
CONDENSER HEADERS AND CONNECTIONS	24-3-34, 12-4-34, 9-4-34	do.	do.	do.	OK	
CONDENSER CASINGS	14-4-34	5 to 10 lbs \square	30 lbs \square	✓	OK	
EVAPORATOR CASINGS	20-4-34	abt. 15 lbs \square	30 lbs \square	✓	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 14th & 15th Sept. 1934 Density of Brine 49 by Tweedell 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 2.5° F & 9° F, outflow and return brine -8° F & -6° F
atmosphere 66° F cooling water inlet and discharge 60° F & 64° F gas in condensers 72° F and evaporators -10° F
the average temperature of the refrigerated chambers 9° 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 10° 11.5° F = 1.96° F per hour

SPARE GEAR.

Are the machines in accordance with Section 4, Clause 2 of the Rules

Are the working parts of the machines, pumps and motors respectively, interchangeable

ARTICLES SUPPLIED AS PER RULE.

ADDITIONAL SPARE GEAR SUPPLIED.

1 Crankshaft with balance weights
6 pistons & rods complete with rings for compr.
4 sets of piston rings for each compressor in addition
1 spindle & impeller for brine pump, 1 set brushes for brine pump
1 do. do. do. water pump, 1 do. do. water pump
2 pr. main bearing shells lined W. M. 1 addl. brine pump in E.R.
2 do. do. bolts & nuts
1 pair crankpin bearings with bolts & nuts.
2 pair X head bearings with bolts & nuts.
12 lubricator gland leathers
12 do. piston leathers
1 set of leather moulds
3 lengths each of $\frac{1}{2}$ " & $\frac{1}{4}$ " W.I. piping
12 W.I. sockets & backnuts each size $\frac{1}{2}$ " & $\frac{1}{4}$ "
3 W.I. bends each $\frac{1}{2}$ " & $\frac{1}{4}$ "
1 set ratchet screwing dies for above.
2 pr. CO₂ pipe flanges
2 sets copper joint rings for each compr.
1 set do. do. do. for other joints
2 regulator valve spindles
1 bucket & plunger for ram brine pump
1 set valves & springs for do.
4 sets spl. metal rings for each compr. gland
assorted bolts & nuts
Sundry brine cocks.
1 set of valves seats & springs for each compressor
36 addl. springs
2 springs for water relief valve
2 do. brine do. do.
2 do. CO₂ safety valve
1 pump for pressure lubricator.
3 CO₂ gauges, valves & pipes for same
2 hydrometers
36 safety valve discs.
6 brine return thermometers
1 special Kew tested thermometer
1 each size CO₂ screw down valve.
1 separator drain fitting
1 length of copper drainage pipe
 $\frac{1}{2}$ butt special hydraulic leather
1 brine gauge.
6 bolts & 6 washers for mach. coupling
1 spare 2 bladed rotor for 45" axis fan
1 do. do. do. 35" do. do.
1 do. do. do. 22 $\frac{1}{2}$ " do. do.
1 fitted box containing compr. parts.
1 Half Coupling

ELECTRICAL SPARES.

Machine motor Centri. Water pump Centri. Priming pump Plunger Priming pump

Armature packed 1 1 1 1
Set of field coils 1 1 1 1
Set of interpole coils 1 1 1 1
Ring of brush holders 1 1 1 1
Set of brushes 1 1 1 1
Set of bearings 3 2 4 1
Set of controller spars 1 1 1 1

ELECTRICAL SPARES FOR FANS.

Horizontal vertical Set of 6000 prop. type
45" 35" 22 $\frac{1}{2}$ 22 $\frac{1}{2}$ 12 $\frac{1}{2}$ 12 $\frac{1}{2}$
Complete motor 1 1 1 1 1 1
Set of brushes 4 1 4 2 4 1
Set of control gear 1 1 1 1 1 1

ARTICLES REQUIRED BY RULES AND NOT YET SUPPLIED

The foregoing is a correct description of the Refrigerating Machinery.

J. & E. HALL, LTD.

C. Nicholson
for DIRECTOR

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Manufacturer.

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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. 176 A	Corrugated Galv. Iron	G. Cork	11½"	1"	✓	✓	G. Cork	10"	1"
	(Fore Peak)									
	FRAME No. 148 F	✓	do	12½"	"	✓	✓	do	7½"	"
	A	✓	do	4"	"	✓	✓	do	4"	"
	FRAME No. 121 F	✓	do	11½"	"	✓	✓	do	8"	"
	A	✓	do	4"	"	✓	✓	do	4"	"
	FRAME No. 98 F	✓	do	10"	"	✓	✓	do	10"	"
	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
	FRAME No. (Boiler Room) F									
	A									
	FRAME No. 64 A	✓	Silicate of cotton	9½"	1"	✓	✓	Silicate of cotton	10"	1"
	(Engine Room)									
	FRAME No. 42 F	✓	G. Cork	4"	"	✓	✓	G. Cork	4"	"
	A	✓	do	10"	"	✓	✓	do	7"	"
	FRAME No. 18 F	✓	do	10"	"	✓	✓	do	10"	"
	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
	FRAME No. F									
	A									
	FRAME No. (After Peak) F									
SIDES	✓	✓	G. Cork	11½"	1"	✓	✓	G. Cork	11½"-10½"	1"
OVERHEADING	✓	✓	do	10"-14"	1"	✓	✓	do	10"-14"	1"
FLOORS OF CHAMBERS	1"	1" Trg. + rubberoid	do	6"	1" + 1½"	✓	✓	✓	✓	✓
TRUNK HATCHWAYS	No. 4 upper trunk, { 5" G. Cork + 2 @ 1" Trg. in chambers } 2 @ 3" slab cork + 1" Trg. in hatch									
THRUST RECESS, SIDES AND TOP	✓	✓	✓	✓	✓					
TUNNEL SIDES AND TOP	1" airspace, 1" Trg. + rubberoid, 9" G. Cork, 1" 1½" Trg.									
TUNNEL RECESS, FRONT AND TOP	✓	✓	✓	✓	✓					

FRAMES OR REVERSE FRAMES, FACE

Double hair felt.

BULKHEAD STIFFENERS, TOP

BOTTOM

AND FACE

RIBBAND ON TOP OF DECKS

8" x 3" redwood with slab cork + asphalt at bulkheads, gran. cork at sides in way of air trunks. Lead gutterways in way of air trunks.

SIDE STRINGERS, TOP

BOTTOM

AND FACE

WEB FRAMES, SIDES

AND FACE

BRACKETS, TOP

Average 8" G. Cork, double 1" Trg.

BOTTOM

Average 8" G. Cork, double 1" Trg.

AND FACE

3" felt.

INSULATED HATCHES, MAIN

6" G. Cork double 1" lining top + bottom

BILGE

5" G. Cork, double 1" lining at bottom, 1" 1½" at top

MANHOLE

5" G. Cork, double 1" lining at bottom, 1" 1½" at top.

HATCHWAY COAMINGS, MAIN

Solid 7" p.pine

BILGE

2½" p.pine

HOLD PILLARS

Silicate of cotton, 1½" lining, corners sheathed galv. iron.

MASTS

VENTILATORS

6" silicate of cotton, 1½" lining.

Are insulated plugs fitted to provide easy access to bilge suction roses

Yes

tank, air, and sounding pipes port. insul. heels of pillars

and manhole doors of tanks plugged

Are insulated plugs fitted to ventilators

Yes

cargo ports

Yes

and side lights

Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected

Yes

if so, how

2" elm doubling, 2ft. clear of hatchways

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 Cofferdam, one frame space long, arranged between oil fuel bunkers and No. 3 hold.

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

Yes

Cargo Battens, Dimensions and spacing, sides

3" x 3" spaced 12" centres floors

3" x 3" spaced 12" centres tunnel top

3" x 3" spaced 12" centres

fixed or portable

Floors portable
Sides fixed

Are screens fitted over the brine grids at chamber sides

No. 2, 3 + 4 inches
also Galv. iron at tunnel sides

hinged or permanently fixed

portable.

Thermometer Tubes, No. and position in each chamber

As approved

diameter

2½" 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

Scuppers to bilges

Where sluices, scupper pipes, and drain pipes are fitted are means provided for blanking them off

Yes

What provision is made for draining the refrigerating machinery room

Scuppers to bilge

brine return room

Scuppers to bilge

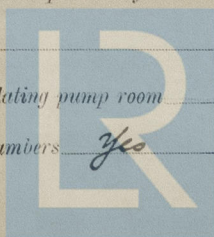
fan room

Scuppers to bilge

water circulating pump room

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

Yes



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Sounding Pipes, No. and position in each chamber situated below the load water line *Sounding pipes from weather deck*
Diameter *2 1/2"* 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 *Overhead stepped, remainder t.g.* 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 *Bituminous*
Air Trunkways in Chambers, inside dimensions, main *N° 2 hold 3' x 3' 6" 2' 6" N° 5 hold 4' x 2' 1' 9"* and branch *-*
Are they permanently fixed or collapsible, or portable *portable* State position in chambers *In N° 2 & 3 under hatch sides & at beam knees, In N° 4 on crown of tunnel & in centre & at beam knees. In N° 5 at centre line and at beam knees.*
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 3/4" internal* Are they galvanised externally *Yes*
How are they arranged in the chambers *Grids in sections, double & triple battens at fan bulkheads.*
Air trunkway only in N° 3 hold.
Thawing Off, what provision is made for removing the snow from the cooling pipes in the chambers *Brine heating*

The foregoing is a correct description of the Insulation and Appliances.
J. Barclay, Murray Insul & Builders.

Plans. Are approved Plans or Specifications forwarded herewith for the Refrigerating Machinery and Insulation *Yes*
(If not, state date of approval)
Is the Refrigerating Machinery and Appliances duplicate of a previous case *✓* If so, state name of vessel *✓*
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 insulation has been fitted under Special Survey and the materials and workmanship are good.
Class + RMC in red.
The machinery has been efficiently installed and tried under working conditions with satisfactory results.

It is submitted that this vessel is eligible for THE RECORD.
+ Lloyd's RMC
9.34.
DA 17/9/34

PARTICULARS TO BE ENTERED IN REGISTER BOOK.

REFRIGERATING MACHINES.					System of (1) Refrigerating (2) Insulating the Chambers.	POWER.		INSULATED CARGO CHAMBERS.	
No. of Units.	No. of Compressors.	System.	Makers.	Date of Construction.		Cubic feet of air delivered per hour.	Ice melting capacity per 24 hours. Tons.	No.	Capacity. Cubic ft.
3	6	Cash. Only	J. E. Hall Ltd.	1934	Brine Scotton & Co. Ltd.		168	19	497.625

Fee *£ 48: 0: 0* Fee applied for, *15/9/1934*
Travelling Expenses *£ : :* Received by me *27.9.34*
Committee's Minute *TUE 18 SEP 1934*
Assigned *+ Lloyd's RMC 9.34*
D. Gemmell
Surveyor to Lloyd's Register.
J. C. Coates
John Rundle