

REPORT ON REFRIGERATING MACHINERY AND APPLIANCES.

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Sunderland
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19

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(No. of Visits

7/1/48

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on the Refrigerating Machinery and Appliances of the S. S. "ARABIA" Tons 8719.74Vessel built at Sunderland By whom built Sir J. Laing & Sons, Ltd. Yard No. 774 When built 1947Owners Cunard White Star Line, Ltd. Port belonging to Liverpool Voyage ✓Refrigerating Machinery made by Messrs L. Sterne & Co., Ltd. Machine Nos. 2905
2906
2907 When made 1947Insulation fitted by Cork Insulation Co., Ltd. When fitted During Construction System of Refrigeration AmmoniaMethod of cooling Cargo Chambers Cold Air System Insulating Material used Slab cork & Slag WoolNumber of Cargo Chambers insulated Fourteen (14) Total refrigerated cargo capacity 130,000 cubic feet.

DESCRIPTION OF REFRIGERATING MACHINERY. Where placed

Refrigerating Units, No. of _____ No. of machines _____ Is each machine independent _____

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

Compressors, driven direct or through ^{single} } reduction gearing. Compressors, single or double acting _____ If multiple effect compression
^{double} }
are relief valves or safety discs fitted _____ No. of cylinders to each unit _____ Diameter of cylinders _____

Diameter of piston rod _____ Length of stroke _____ No. of revolutions per minute _____

Motive Power supplied from _____
(State number of boilers, oil engines or electric generators supplying the motive power.)

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 _____

Breadth and thickness of crank webs _____ No. of sections in crank shaft _____ Revolutions of engines per minute _____

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 _____

AIR RECEIVERS:—Is each receiver, which can be isolated, fitted with a safety valve as per Rule

Can the internal surfaces of the receivers be examined _____ What means are provided for cleansing their inner surfaces _____

Is there a drain arrangement fitted at the lowest part of each receiver _____ If made under survey _____

No. of Receivers _____ Cubic capacity of each _____ Internal diameter _____ thickness _____

Seamless, lap welded or riveted longitudinal joint _____ Material _____ Range of tensile strength _____ Working pressure by Rules _____

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

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

Reduction Gearing _____ Pitch circle diameter, pinion _____ Main wheel _____ Width of face _____

Distance between centres of pinion and wheel faces and the centre of the adjacent bearings, pinion _____ Main wheel _____

Pinion shafts, diameter at bearings _____ Main wheel shaft, diameter at bearings _____

Gas Condensers, No. of _____ Cast iron or steel casings _____ Cylindrical or rectangular _____ Are safety valves fitted _____

to casings _____ No. of coils in each _____ Material of coils _____ Can each coil be readily shut off or disconnected _____

Water Circulating Pumps, No. and size of _____ how worked _____ Gas Separators, No. of _____

Gas Evaporators, No. of _____ Cast iron or steel casings _____ Pressure or gravity type _____ If pressure type, are safety

valves fitted _____ No. of coils in each casing _____ Material of coils _____ Can each coil be readily shut off or disconnected _____

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 _____ how worked _____

Brine Cooling System, closed or open _____ Are the pipes and tanks galvanised on the inside _____

No. of brine sections in each chamber _____

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

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

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Are thermometers fitted to the outflow and to each return brine pipe _____ 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 _____

Are the number and capacity of the machines and the number of pumps and sea connections in accordance with Section 2, Clause 1 of the Rules _____

Is the exhaust steam led to the main and auxiliary condensers _____

HYDRAULIC AND OTHER TESTS.

DESCRIPTION.	Date of Test.	Working Pressure.	Hydraulic Test Pressure.	Air Test Pressure.	Stamped.	REMARKS.
ENGINE CYLINDERS (IF TESTED) ...						
GAS COMPRESSORS ...						
" SEPARATORS ...						
" MULTIPLE EFFECT RECEIVERS ...						
" CONDENSER COILS ...						
" EVAPORATOR COILS ...						
" CONDENSER HEADERS AND CONNECTIONS ...						
" CONDENSER CASINGS ...						
" EVAPORATOR CASINGS ...						
NH ₃ CONDENSER, EVAPORATOR AND AIR COOLER COILS AFTER ERECTION IN PLACE ...	19-12-47	-	-	200 lb/10"	T9	
BRINE PIPING AFTER ERECTION IN PLACE ...	16-12-47	25 lb/10"	50 lb/10"	-	T9	

Have important steel castings and forgings been tested in accordance with the Rules _____

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

Dates of test *2, 3, 4, 5 January 1948* Density of Brine *45°* by *Loadall* hydrometer

Temperatures (when the cargo chambers are cooled down to the required test temperatures)

or, delivery and return air at direct expansion or brine cooled batteries _____

atmosphere *51°F* cooling water inlet and discharge *46°F* & *52°F* gas in condensers *60°F 65°F 64°F* and evaporators *-28°F -25°F -25°F*

the average temperature of the refrigerated chambers _____ 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 *Approx. 4°F to 14°F*

SPARE GEAR.

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

Has the spare gear required by the Rules been supplied _____

Additional Spare Gear Supplied: _____

The foregoing is a correct description of the Refrigerating Machinery.

Manufacturer.

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.
FRAME No. <i>✓</i> (Fore Peak)	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
FRAME No. <i>16/</i> Upper & Lower Tween	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Compressed Slab Cork</i>	<i>10"</i>	<i>3/8" V.P.P. emulsified asphalt</i>
FRAME No. <i>145</i> Upper Tween	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Do.</i>	<i>8"</i>	<i>1" T. & G.</i>
FRAME No. <i>130</i> Upper & Lower Tween	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Do.</i>	<i>8"</i>	<i>3/8" V.P.P. emulsified asphalt</i>
FRAME No. <i>97</i> (Boiler Room) Upper & Lower Tween	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Do.</i>	<i>4"</i>	<i>Do.</i>
FRAME No. <i>✓</i> (Engine Room)	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
FRAME No. <i>59</i> Upper Tween	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Compressed Slab Cork</i>	<i>10"</i>	<i>3/8" V.P.P. emulsified asphalt</i>
FRAME No. <i>36</i> Upper Tween	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Do.</i>	<i>4"</i>	<i>Do.</i>
FRAME No. <i>10</i> Upper Tween	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Do.</i>	<i>8"</i>	<i>Do.</i>
FRAME No. <i>✓</i> (After Peak)	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>Do.</i>	<i>10"</i>	<i>Do.</i>
SIDES ...	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
OVERHEADING ...	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
FLOORS OF CHAMBERS ...	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
TRUNK HATCHWAYS ...	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
THRUST RECESS, SIDES AND TOP ...	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
TUNNEL SIDES AND TOP ...	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>
TUNNEL RECESS, FRONT AND TOP ...	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>

FRAMES OF REVERSED FRAMES, FACE *3" x 2" W. Wood grounds & as approved.*

BULKHEAD STIFFENERS, TOP *3" x 2" W. Wood* BOTTOM *3" x 2" W. Wood* AND FACE *3" x 2" W. Wood (horizontal)*

RIBBAND ON TOP OF DECKS *On 2" Dk., transversely at FR. NO. 59 at fore end of NO. 5 Upper Tween, 3" Slab cork with 1/2" asphalt facing (3'0" wide)*

SIDE STRINGERS, TOP *✓* BOTTOM *✓* AND FACE *✓*

WEB FRAMES, SIDES *3" x 2" W. Wood grounds with 1" T. & G.* AND FACE *3" x 2" W. Wood grounds & 1" T. & G. lining.*

BRACKETS, TOP *lining and backed with slab cork* BOTTOM *✓*

INSULATED HATCHES, MAIN *✓* BILGE *✓* MANHOLE *✓*

HATCHWAY COAMINGS, MAIN *✓* BILGE *✓*

HOLD PILLARS *✓*

MASTS *✓* VENTILATORS *4" Slagwool & 4" slab cork & faced with 3/8" V.P.P. emulsified asphalt*

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 *Yes* 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 *✓*

and for draining the tank top *✓*

Fireproof Insulation. Is the insulation and woodwork fireproof in way of bunkers or any surfaces exposed to excessive heat *Yes, so far as practicable*

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 *2" x 2" W. W. @ 12" apart* floors *3" x 2" W. W. beams* tunnel top *✓*

fixed or portable *Portable* Are screens fitted over the brine grids at chamber sides *✓* hinged or permanently fixed *✓*

Thermometer *✓* No. and position in each chamber *2 in each chamber (1 forward & 1 aft as approved). Malone*

Precision Distance Thermometers M. A. I. Type are they fitted in accordance with Section 3, Clause 8 *Yes, so far as practicable*

Protection of Pipes. Are all pipes, including air and sounding pipes, which pass through or into insulated chambers, well insulated *Yes*

Draining Arrangements. What provision is made for draining the inside of the chambers *✓* Scuppers led to hold bilges & fitted with liquid sealed traps

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

What provision is made for draining the refrigerating machinery room *Scuppers led to engine room bilges*

brine return room *Scuppers led to E.R. bilges* fan room *Scuppers led to hold bilges* water circulating pump room *✓*

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

5.5 Arabia

To be attached to refrigerating log entry book. See Sunderland Report 34810.
Cooling Down + Temperature Rise Tests held at Liverpool between Friday 2nd January and Monday 5th January 1948.

Cooling down began at 9.30 AM on Friday 2.1.48 + ended at 5.30 PM Sunday 4.1.48.

Temperatures of refrigerated spaces noted after machinery had been shutdown for eighteen hours at 11.30 AM on Monday 5.1.48.

machines	Condenser		Evaporator	
	Temperature	Pressure.	Temperature	Pressure
Port	60°F	95 lbs/sq.	-28°F.	5 lbs/sq.
Center	65°F.	104 lbs/sq.	-25°F	5 lbs/sq.
Starboard	64°F	106 lbs/sq.	-25°F.	5 lbs/sq.

Sea.	Inlet 46°F	Discharge 52°F
Brine	Outlet -11½°F -8°F -10°F	Return -11°F -7°F -8½°F
Brine Density	45° Twaddell.	Atmosphere 51°F

Space Temperatures			Temperature after 18 hours		Temperature Rise
No 2 Upper Tween Deck			Shut down.		per Hour.
Forward Chamber.	Forward	was reduced to	10.25°F	20°F	(Average)
Forward Chamber.	Aft	do	9°F	18.5°F	.47°F
Aft Chamber	Forward	do	7.45°F	15.75°F	
Aft Chamber	Aft.	do	9.75°F	16.5°F	
No 2 Upper Tween Deck			Starboard		
Forward Chamber	Forward	do	9.5°F	18.5°F	
Forward Chamber.	Aft	do	6.25°F	16.75°F	.51°F
Aft Chamber	Forward	do	7.0°F	18°F	
Aft Chamber	Aft.	do	9.5°F	18°F	
No 2 Lower Tween Deck.					
Port Forward.		do	7.5°F	17.5°F	
Port Aft.		do	7.45°F	17°F	.54°F
Starboard Forward		do	7.5°F	17.75°F	
Starboard Aft		do	7.5°F	17°F	
No 3 Upper Tween Deck.					
Port Forward		do	8.5°F	16.75°F	
Port Aft.		do	8.0°F	16°F	.45°F
Starboard Forward		do	8.75°F	17°F	
Starboard Aft.		do	9.0°F	16.75°F	
No 3 Lower Tween Deck.					
Port Forward.		do	8.0°F	17°F	
Port Aft.		do	9.0°F	17.75°F	.47°F
Starboard Forward		do	10.0°F	17.75°F	
Starboard Aft.		do	10.0°F	18.25°F	
No 5 Upper Tween Deck.					
Port Forward		do	7.5°F	18°F	
Port Aft.		do	9.0°F	19.5°F	.64°F
Starboard Forward		do	9.0°F	20°F	
Starboard Aft.		do.	5.0°F	19.25°F	

Liverpool

7/1/48

7/2/47

S.S. Arabia.

To be attached to Refrigerating First Entry Report.
Cooling Down & Temperature Rise Test.

See Sunderland Report 34810.

Spec. Temperatures

No 6 after 2 weeks.

Temperature after 18 hours shutdown.

Temperature Rise/Hour.
(Average.)

Lat Forward was reduced to 8°F

20.45°F

Lat Aft do 8.75°F

21.75°F

Star'd Forward do 9.5°F

22°F

Star'd Aft do 9.5°F

22.75°F

0.71°F

J. V. Nallot.