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R. M. C. No. 41140

No. 2416

REPORT ON REFRIGERATING MACHINERY AND APPLIANCES.

(Received at London Office 19 JAN 1931)

Date of writing Report 8th September 1931

When handed in at Local Office 19 JAN 1931

Port of London

No. in

Reg. Book.

35213

Survey held at Antford Barron Date: First Survey 18th November Last Survey 5th December 1930

(No. of Visits) 5 (Bw 13)

on the Refrigerating Machinery and Appliances of the S.S. "Strathnaver"

Tons Gross 2254Y Net 13620

Vessel built at Barrow By whom built Vickers Armstrong Ltd. Card No. 663. When built 1930

Owners P. & O. Steam Nav. Co. Ltd. Port belonging to London Voyage Australia

Refrigerating Machinery made by J. E. Hall Ltd. Machine No. 8418 8419 8420. When made 1930

Insulation fitted by Vickers Armstrong Ltd. When fitted 1931 System of Refrigeration CO₂ + Brine

Method of cooling Cargo Chambers Brine grids Insulating Material used Cork

Number of Cargo Chambers insulated 8 Total refrigerated cargo capacity 156,000 cubic feet.

DESCRIPTION OF REFRIGERATING MACHINERY. Where placed on Tank top fore of E.R.

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

Total refrigeration or ice-melting capacity in tons per 24 hours 144 Are all the units connected to all the refrigerated chambers yes

Compressors, driven direct or through single reduction gearing. Compressors, single or double acting Single No. of cylinders 3 per mach.

Diameter of cylinders 3 5/16" Diameter of piston rod 1 5/8" Length of stroke 4" No. of strokes per minute 345 each.

Motive Power supplied from Electric motor - direct coupled.

Steam Engines, high pressure, compound, or triple expansion, surface condensing. No. of cylinders 1 Diameter 10"

Length of stroke 4" Working pressure 100 lb. Diameter of crank shaft journals and pins 5"

Breadth and thickness of crank webs 22 dia x 3 1/2" No. of sections in crank shaft one per mach. Revolutions of engines per minute 345

Oil Engines, type 22 dia or 4 stroke cycle Single or double acting B.H.P. 95

No. of cylinders 2 Diameter 10" Length of stroke 4" Span of bearings as per Rule

Maximum pressure in cylinders 100 lb. Diameter of crank shaft journals and pins 5"

Breadth and thickness of crank webs 22 dia No. of sections in crank shaft 1 Revolutions of engine per minute 345

Electric Motors, type Enclosed drip proof No. of 1 per mach. Rated 95 H.P. Kilowatts

Volts at 220 at 345 revolutions per minute. Diameter of motor shafts at bearings

Reduction Gearing, maximum shaft horse power at 1st pinion 1000 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 1 per mach. Cast iron or steel casings Cast iron Cylindrical or rectangular cylindrical

No. of coils in each 9 Material of coils S.D. copper 3/4" x 10" d. Can each coil be readily shut off or disconnected yes

Water Circulating Pumps, No. and size of 2 - 4" centri. how worked electrically Gas Separators, No. of 6

Gas Evaporators, No. of 1 per mach. Cast iron or steel casings Steel Pressure or gravity type pressure

No. of coils in each casing 8 Material of coils S.D. Steel 1" x 1 1/2" Can each coil be readily shut off or disconnected yes

Direct Expansion or Brine Cooled Batteries, No. of Air blown over Side grids in Tween decks & Holds. 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 2 Material of coils S.D. Steel Can each coil be readily shut off or

disconnected Total cooling surface of battery coils 2 - 55" Geroto - 35,000 Is a watertight tray fitted under each battery

Air Circulating Fans, Total No. of 2 - 20" each of 2100 cubic feet capacity, at 1600 revolutions per minute

Steam or electrically driven Electrically 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 3 - 4" centri. how worked electrically

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

No. of brine sections in each chamber N° 2 hold = 11, N° 3 hold = 12, N° 2 Tween deck = 9

N° 3 Tween deck = 6, Special cargo = 2 Sections to each of 4 Chambers

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.

Are thermometers fitted to the outflow and to each return brine pipe yes. Where the tanks are closed are they ventilated as per Rule Open tanks
Where the tanks are not closed is the compartment in which they are situated efficiently ventilated yes
Steam Condensing Plant. State what provision is made for condensing steam, in terms of Section 4, Clauses 13 and 14.
Rectifier.

HYDRAULIC AND OTHER TESTS.

DESCRIPTION.	Date of Test.	Working Pressure.	Hydraulic Test Pressure.	Air Test Pressure.	Stamped.	REMARKS.
ENGINE CYLINDERS (IF TESTED)	18-11-30					
GAS COMPRESSORS	21-11-30	1000 lb. sq. in.	3000 lb. sq. in.	1500 lb. sq. in.	OK	
" SEPARATORS	5-12-30	do.	do.	do.	OK	
" CONDENSER COILS	4-11-30	do.	do.	do.	OK	
" EVAPORATOR COILS	18-11-30	do.	do.	do.	OK	
" CONDENSER HEADERS AND CONNECTIONS	4-11-30	do.	do.	do.	OK	
" CONDENSER CASINGS	21-11-30	do.	do.	do.	OK	
" EVAPORATOR CASINGS	28-11-30	5 to 10 lb. sq. in.	30 lb. sq. in.	-	OK	
NH. CONDENSER, EVAPORATOR AND AIR COOLER COILS AFTER ERECTION IN PLACE	25-11-30	20 to 25 lb. sq. in.	50 lb. sq. in.	-	OK	
BRINE PIPING AFTER ERECTION IN PLACE	18-6-31	15 lb. sq. in.	90 lb. sq. in.	-	-	Rated by Hydraulic Engineer to Class Requirements

Cooling Test. Has the refrigerating machinery been examined under full working conditions, and found satisfactory yes
Dates of test 30th and 31st July 1931 Density of Brine 4.8 by 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 -4° F & -2° F
atmosphere 64° F cooling water inlet and discharge 62° F & 68° F gas in condensers 80° and evaporators 0°
the average temperature of the refrigerated chambers 8.62° F and the rise of temperature in these chambers upon the expiration of 24 hours
time after the machinery and cooling appliances have been shut off 16.12° F

SPARE GEAR.

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

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

ARTICLES SUPPLIED AS PER RULE.

1 crankshaft
3 pistons & rods for compressors
1 set piston rings for each comp. piston
1 impeller & shaft for circulating water pump
1 do. do. brine pump
1 addl. brine pump in engine room
2 bolts & nuts for main bearing
2 do. do. connecting rod big ends
2 do. do. crosshead
1 set of 2 leather moulds
3 lengths each $1\frac{1}{2} \times 1\frac{1}{2}$ W.I. piping & 3 bends each size
12 sockets & backnuts each size $1\frac{1}{4} \times 1\frac{1}{2}$
2 pair CO₂ pipe flanges
1 set ratchet dies to screw $1\frac{1}{4} \times 1\frac{1}{2}$ pipes & taps
Sundry brass cocks & valves
Assorted bolts & nuts
1 regulator spindle
6 lubricator piston leathers
6 do. do. gland do.
2 sets of copper joint rings throughout
1 extra set do. do.
1 set special metal rings for each comp. gland

ADDITIONAL SPARE GEAR SUPPLIED.

1 set suction valves seats & springs
1 set delivery do. do. for each comp.
24 addl. springs for comp. valves
3 springs for water relief valves
3 do. do. brine do.
1 pair crankpin shells lined w. M.
1 pair X head brasses
1 pump for press. lubricator
24 safety valve discs
1 leather cutter
2 CO₂ pressure gauges
3 hydrometers
6 brass cased thermometers
1 length 7 copper gauge pipe
2 CO₂ gauge valves & 6 spare pipe
4 gas charging valves
4 valves for separator drain
2 No. 2 Well oil filter
1 pair tools for form pipe unions
1 fitted brace
3 coupling bolts & 3 sets leather washers for mach. coupling
3 springs for CO₂ safety valve

ELECTRICAL SPARES.

1 Armature packed for storage
1 set brushes for each motor
1 set brush holder
1 complete interior for controller
Machine Motors
Brine & Water Pump Motors
Fan Motors each size.

ARTICLES REQUIRED BY RULES AND NOT YET SUPPLIED.

The foregoing is a correct description of the Refrigerating Machinery.

J. & E. HALL, LTD

Manufacturer.

Chichesters

DESCRIPTION OF INSULATION.

IN LOWER HOLD CHAMBERS.

IN 'TWEEN DECK CHAMBERS.

BULKHEADS.

	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. 201	F										
	A	✓	✓	Gran Cork	13"	1 1/4" x 8" 60	✓	✓	Gran Cork	8"	1 1/4" x 8" 60
FRAME No. 144	F	✓	✓	do	13"	do	✓	✓	do	4"	do
	A	✓	✓	do	4"	do	✓	✓	do	4"	do
FRAME No. 164	F						✓	✓	do	5"	do
	A						✓	✓	do	4"	do
FRAME No. 156 (Boiler Room) REF	F			Gran Cork	10"	1 1/4" x 8" 40	✓	✓	✓	8"	do
	A			Gran Cork	10 to 4"	3/4" Cement					
FRAME No. (Engine Room)	A										
FRAME No.	F										
	A										
FRAME No.	F										
	A										
FRAME No.	F										
	A										
FRAME No. (After Peak)	F										
SIDES	...	...	...	Gran Cork	11"	1 1/4" x 8" 60	...	...	Gran Cork	11"	1 1/4" x 8" 60
OVERHEADING	...	...	...	" "	9"	1 1/4" x 8" 60	...	...	do	9"	do
FLOORS OF CHAMBERS	1 1/2	1 1/4" x 8"	...	8"	2 1/2" x 8" 60	...	...	...	2 1/2" x 8" 60	Deck	...
TRUNK HATCHWAYS	...	...	...	...	...	...	...	...	...	...	...
THRUST RECESS, SIDES AND TOP	...	...	...	...	...	...	...	...	...	...	...
TUNNEL SIDES AND TOP	...	...	...	...	...	...	...	...	...	...	...
TUNNEL RECESS, FRONT AND TOP	...	...	...	...	...	...	...	...	...	...	...

FRAMES OR REVERSE FRAMES, FACE 1" Cork and 1 1/4" 60
BULKHEAD STIFFENERS, TOP ✓ BOTTOM ✓ AND FACE 1" Cork & 1 1/4" 60
RIBBAND ON TOP OF DECKS 2 1/2" Oregon Pine
SIDE STRINGERS, TOP ✓ BOTTOM ✓ AND FACE ✓
WEB FRAMES, SIDES ✓ AND FACE ✓
BRACKETS, TOP 6" Gran Cork and 5" 60 BOTTOM ✓ AND FACE ✓
INSULATED HATCHES, MAIN 6" Gran Cork & Pitch Pine BILGE 6" Gran Cork & Pitch Pine MANHOLE 6" Gran Cork and Pitch Pine
HATCHWAY COAMINGS, MAIN Pitch Pine & Sheet Zinc BILGE Pitch Pine & Sheet Zinc
HOLD PILLARS 1" Galv. Cork and 1 1/4" 60 and 1" Kelt & 2 1/2" Manila Rope
MASTS ✓ VENTILATORS 8" Gran Cork and 1 1/4" 60
Are insulated plugs fitted to provide easy access to bilge suction roses yes tank, air, and sounding pipes yes heels of pillars yes
and manhole doors of tanks yes Are insulated plugs fitted to ventilators yes cargo ports yes and side lights yes
Is the insulation of the lower hold floor and tunnel top in way of the hatchways protected yes if so, how 2" Elm doubling
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 none adjacent to Chamber

Coal Bunker Bulkheads, and Brine Outflow and Return Pipes passing through coal bunkers. Is the insulation, so far as practicable, fireproof yes

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 x about 11 floors 3 x 3 x about 11 tunnel top ✓

fixed or portable Both Are screens fitted over the brine grids at chamber sides yes hinged or permanently fixed portable

Thermometer Tubes, No. and position in each chamber 4 in each compartment supplemented by Electrical thermometers

diameter 2 1/2" Calvernia 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 traps & scuppers 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 motor pump and main suction

brine return room Scuppers fan room Scuppers water circulating pump 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 *Three in lower holds at off-end; 'Green deck by their stabs*

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 *Yes 1/2 checked* Are cement facings reinforced with expanded steel lattice *Yes*

How is the expanded metal secured in place *Staples*

How are the cork slabs secured to the steel structure of the vessel *Jambled and Stapled to Grounds and adjacent Slats*

Air Trunkways in Chambers, inside dimensions, main *Screen over Brine Grids and branch*

Are they permanently fixed or collapsible, or portable *Portable* State position in chambers *Sides & Ends*

Where air trunkways pass through watertight bulkheads, are they fitted with watertight doors *None* 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 3/4"* Are they galvanised externally *No*

How are they arranged in the chambers *Overhead, Sides and Ends*

Thawing Off, what provision is made for removing the snow from the cooling pipes in the chambers *Warm Brine*

The foregoing is a correct description of the Insulation and Appliances. **FOR VICKERS-ARMSTRONGS LIMITED.**
Hubert Thompson Builders.
 DIRECTOR.

Plans. Are approved Plans or Specifications forwarded herewith for the Refrigerating Machinery *Yes* and Insulation *Yes*
 (If not, state date of approval)

Is the Refrigerating Machinery and Appliances duplicate of a previous case *Yes* If so, state name of vessel *Complete*

If the survey is not complete, state what arrangements have been made for its completion and what remains to be done

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 and insulation has been efficiently fitted on board. The tests have been carried out satisfactorily in accordance with the Rules. In my opinion the vessel is eligible to have the notation of Lloyd's R.M.C. 9.31 made in the Register Book.

It is submitted that this vessel is eligible for the notation of Lloyd's R.M.C. 9.31.

+ Lloyd's R.M.C. 9.31.

R.M. 14/9/33

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	9	Carb. Ammonia	J. E. Hall & Co.	1930	(1) Engine (2) G. C. K.		1444	8	156,000

LON. A/c £6
 Fee *ARM. A/c £12* £ 18: 0: 0 (Fee applied for, 19 *22.9.31*)
 Travelling Expenses £ : : Received by me, *22.9.31*

D. Gemmell & Co. Ltd.
 Surveyor to Lloyd's Register.

Committee's Minute, TUE. 15 SEP 1931 TUE. 23 MAY 1933

Assigned *+ Lloyd's R.M.C. 9.31* TUE. 20 JUN 1933

CERTIFICATE WRITTEN.

FRI. 6 OCT 1933

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