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R. T. C. No. 41140

No. 2416

REPORT ON REFRIGERATING MACHINERY AND APPLIANCES.

(Received at London Office 19 JAN 1931)

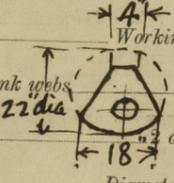
Date of writing Report 8th September 1931. When handed in at Local Office 19 JAN 1931. Port of London
No. in Reg. Book. 352/3. Survey held at Dartford Barru Date: First Survey 18th November 1930 Last Survey 5th December 1930
(No. of Visits 5 Bw 13)

on the Refrigerating Machinery and Appliances of the S.S. "Strathnaver" Tons (Gross 22544 Net 13620)
Vessel built at Barrow By whom built Vickers Armstrong Ltd. and No. 663. When built 1930
Owners P. & O. Stear. Nav. Co. Ltd. Port belonging to London Voyage Australia
Refrigerating Machinery made by G. 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 Yank 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 ✓ Diameter ✓
Length of stroke ✓ Working pressure ✓ Diameter of crank shaft journals and pins 5"
Breadth and thickness of crank webs 22 dia x 3 3/8" No. of sections in crank shaft one per mach. Revolutions of engines per minute 345
Oil Engines, type ✓ 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 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 _____ 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" h. x 1" o.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" h. x 1 5/8" 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 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^o 2 hold = 11, N^o 3 hold = 12, N^o 2 Tween deck = 9
N^o 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
Rectical.

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. □	3000 lb. □	1500 lb. □	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	5-12-30	do.	do.	do.	OK	
CONDENSER CASINGS	28-11-30	5 to 10 lb. □	30 lb. □	-	OK	
EVAPORATOR CASINGS	25-11-30	20 to 25 lb. □	50 lb. □	-	OK	
NH ₃ CONDENSER, EVAPORATOR AND AIR COOLER COILS AFTER ERECTION IN PLACE	18-6-31					Tested by hydraulic pressure
BRINE PIPING AFTER ERECTION IN PLACE	8-7-31	15 to 20 lb.	90 lb. □	✓	✓	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 *Yeadells* 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 *16.42° 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

ADDITIONAL SPARE GEAR SUPPLIED.

1 crankshaft
 3 pistons & rods for compressor
 1 set piston rings for each comp. piston
 1 impeller & shaft for circulating water pump
 1 do. do. brine pump
 1 add. brine pump in engine room
 2 bolts & nuts for chain 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 brine cocks & valves
 Assorted bolts & nuts
 regulator spindle
 6 lubricator piston leathers
 6 do. gland do.
 2 sets of copper joint rings throughout
 1 extra set do. do.
 1 set special metal rings for each comp. gland

1 set suet valves seats & springs
 1 set delv. do. for each comp.
 24 add. springs for comp. valves
 3 springs for water relief valves
 3 do. do. brine do. 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 of copper gauge pipe
 2 CO₂ gauge valves & 6 spare pipe
 4 gas charging valves
 4 valves for separator drains
 2 N° 2 Well oil filter
 1 pair tongs for brine pipe unions
 1 fitted bit
 3 coupling bolts & 3 sets leather washers for mach. coupling
 3 springs for CO₂ safety valve

ELECTRICAL SPARES.

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

ARTICLES REQUIRED BY RULES AND NOT YET SUPPLIED.

The foregoing is a correct description of the Refrigerating Machinery.

J. & E. HALL, LTD. Manufacturer.
 Clifton

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. (Fore Peak)	A									
FRAME No. 201	F									
FRAME No. 144	A	✓	Gran Cork	13"	1/4" L.S.P. 49	✓	✓	Gran Cork	8"	1/4" L.S.P. 49
	F	✓	"	13"	"	✓	✓	"	4"	"
FRAME No. 144	A	✓	"	4"	"	✓	✓	"	4"	"
	F									
FRAME No. 144	F									
	A	✓				✓	✓	"	5"	"
FRAME No. 156 (Boiler Room) REF.	F		Gran Cork	10"	1/4" L.S.P. 49	✓	✓	"	8"	"
	A		Gran Cork	10 to 4"	3/4" Cement					
FRAME No. (Engine Room)	A									
FRAME No.	F									
FRAME No.	A									
FRAME No.	F									
FRAME No. (After Peak)	F									
SIDES			Gran Cork	11"	1/4" L.S.P. 49			Gran Cork	11"	1/4" L.S.P. 49
OVERHEADING			"	9"	1/4" L.S.P. 49			"	9"	"
FLOORS OF CHAMBERS		1 1/2"	1 1/4" L.S.P.	8"	2 1/2" L.S.P.			2 1/2" Oregon Pine 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 1/4" L.S.P.*
 BULKHEAD STIFFENERS, TOP *✓* BOTTOM *✓* AND FACE *1" Cork & 1/4" L.S.P.*
 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" L.S.P.* 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 3/4" L.S.P. and 1" felt & 2 1/2" manilla rope*
 MASTS *✓* VENTILATORS *8" Gran Cork and 1 1/4" L.S.P.*
 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 *no* and side tights *no*
 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 *none*
 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* damaged or permanently fixed *portable*
 Thermometer Tubes, No. and position in each chamber *4 in each compartment supplemented by Electrical thermometer*
 diameter *2 1/2" Calvernick* 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.



Sounding Pipes, No. and position in each chamber situated below the load water line *Three in lower holds at aft end; 'ween decks 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 *no 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 *Jambed and Stapled to Grounds and adjacent Slats*

Air Trunkways in Chambers, inside dimensions, main *Screens 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 *no* and Insulation *Yes*
 (If not, state date of approval)

Is the Refrigerating Machinery and Appliances duplicate of a previous case *no* If so, state name of vessel *Yes*

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 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.
D.G. 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.
<i>3</i>	<i>9</i>	<i>Carb. Ammonia</i>	<i>J. & E. Hall Ltd.</i>	<i>1930</i>	<i>(1) Reciprocating (2) G. Cook</i>	<i>1444</i>	<i>1444</i>	<i>8</i>	<i>156000</i>

Certificate to be sent to

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

D. Gemmill & Co. Surveyors
 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



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FRI. 6 OCT 1933