

33 1/8"

31.68.

6 ✓

10"

59.9

2

4 1/4"

33.42

6

10"

59.9

1

10"

59.9

1"



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Lloyd's Register
Foundation

REPORT ON MACHINERY.

No. 35810.

Received at London Office SAT - 8 APR. 1916

Date of writing Report 22.2.16 When handed in at Local Office 5.10.16 Port of Glasgow
 No. in Survey held at Glasgow Date, First Survey 6/2/14 Last Survey 23/3/1916
 Reg. Book. on the H.M.S. "Avenger" (Number of Visits 133)
 Tons Gross Net
 Master Built at Glasgow By whom built Fairfield & Co. Ltd. (H99) When built 1916
 Engines made at Glasgow By whom made Fairfield & Co. Ltd. (H99) when made 1916
 Boilers made at Renfrew By whom made Babcock & Wilcox Ltd. 229 when made 1916
 Registered Horse Power Owners Port belonging to
 Shaft Horse Power at Full Power 14,600 SEA 11,400 Is Refrigerating Machinery fitted for cargo purposes No Is Electric Light fitted Yes

TURBINE ENGINES, &c.—Description of Engines Geared Turbines (2 sets) No. of Turbines 4
 Diameter of Rotor Shaft Journals, H.P. 4 1/2" L.P. 4 1/2" Diameter of Pinion Shaft 4 1/2"
 Diameter of Journals 4 1/2" Distance between Centres of Bearings 3.3" Diameter of Pitch Circle 9.614"
 Diameter of Wheel Shaft 16" Distance between Centres of Bearings 4.3 1/2" Diameter of Pitch Circle of Wheel 124.42"
 Width of Face 2 1/2" (2) Diameter of Thrust Shaft under Collars 16 3/4" as approved 5.1.14 as per rule 14 1/2"
 Diameter of Tunnel Shaft as fitted 14 7/8"
 No. of Screw Shafts 2 Diameter of same as fitted 14 1/4" Diameter of Propeller 16.0" Pitch of Propeller 15.9"
 No. of Blades 3 State whether Moveable Yes Total Surface 694" Diameter of Rotor (Drum) H.P. 25" L.P. 40" Astern 30"
 Thickness at Bottom of Groove, H.P. Solid L.P. 1/2" Astern Solid Revs. per Minute at Full Power, Turbine 1450 Propeller 135

PARTICULARS OF BLADING.

| EXPANSION | H.P. | | | L.P. | | | ASTERN. | | |
|-----------|-------------------|------------------|--------------|-------------------|------------------|--------------|-------------------|------------------|--------------|
| | HEIGHT OF BLADES. | DIAMETER AT TIP. | NO. OF ROWS. | HEIGHT OF BLADES. | DIAMETER AT TIP. | NO. OF ROWS. | HEIGHT OF BLADES. | DIAMETER AT TIP. | NO. OF ROWS. |
| " | 15 1/16" | 20.9 1/16" | 10 | 2 1/4" | 44.44 | 2 | 1 | 31.93 | 4 |
| " | 13 1/16" | 21. 1/16" | 10 | 2 1/16" | 45.305 | 2 | 2 | 33.92 | 4 |
| " | 1 9/16" | 21. 065" | 10 | 3 1/4" | 46.43 | 2 | 4 | 37.91 | 4 |
| " | 1 7/8" | 21.69 | 10 | 4" | 49.93 | 2 | 4 | 37.91 | 4 |
| " | 1 1/2" | 24.94 | 4 | 4 3/4" | 49.42 | 2 | | | |
| " | 1 7/8" | 28.68 | 4 | 5 3/4" | 51.42 | 2 | | | |
| " | 2 5/16" | 29.55 | 4 | 6 7/8" | 53.66 | 2 | | | |
| " | 2 7/8" | 30.68 | 4 | 8 1/4" | 56.41 | 2 | | | |

Size of Feed pumps 3 WEIRS 12 1/2" x 18" Number of Donkey Engines 3. One fitted 4 1/2" x 12 1/2" x 12 1/2" Ball 10 1/2" x 12 1/2"
 Size of Bilge pumps (2) Motor 2 Horsepower 3 x 5" One Motor 3 Horsepower 4 1/2" x 9"
 Size of Bilge suction in Engine Room 2 - 3 1/2" x 1 1/2". Main Room 3 - 3 1/2" x 2 1/2" Tunnel 3 - 2 1/2"
 In Holds, &c. 2 - 3 1/2" in each Hold

Bilge Injections 2 sizes 15" Connected to condenser or to circulating pump pump Is a separate Donkey Suction fitted in Engine Room & size Yes 8"
 Are the bilge suction pipes fitted with roses Yes Are the roses in Engine room always accessible Yes
 Are connections with the sea direct on the skin of the ship Yes Are they Valves or Cocks Both Yes
 Are they fitted sufficiently high on the ship's side to be seen without lifting the stokehold plates Yes Are the Discharge Pipes above or below the deep water line Below
 Are they each fitted with a Discharge Valve always accessible on the plating of the vessel Yes Are the Blow Off Cocks fitted with a spigot and brass covering plate Yes
 Are pipes carried through the bunkers None (oil bunkers) How are they protected
 Are Pipes, Cocks, Valves, and Pumps in connection with the machinery and all boiler mountings accessible at all times Yes
 Are Bilge Suction Pipes, Cocks, and Valves arranged so as to prevent any communication between the sea and the bilges Yes
 Is Screw Shaft Tunnel watertight Yes Is it fitted with a watertight door Yes worked from U.E.R. Platform

ERS, &c.—(Letter for record 5) Manufacturers of Steel Bolville
 Heating Surface of Boilers 34080 Is Forced Draft fitted Yes No. and Description of Boilers 10 Babcock & Wilcox Water tube
 Working Pressure 230 Tested by hydraulic pressure to 460 Date of test No. of Certificate
 Are each boiler be worked separately Yes Area of fire grate in each boiler 108.24 No. and Description of Safety Valves to
 Are the boiler Area of each valve Pressure to which they are adjusted 235 lb Are they fitted with easing gear Yes
 Are the smallest distance between boilers or uptakes and bunkers or woodwork Mean dia. of boilers Length Material of shell plates
 Are the shell plates welded or flanged Descrip. of riveting: cir. seams
 Are the g. seams Diameter of rivet holes in long. seams Pitch of rivets Lap of plates or width of butt straps
 Are the percentages of strength of longitudinal joint plates Working pressure of shell by rules Size of manhole in shell
 Are the No. and Description of Furnaces in each Boiler Material Outside diameter
 Are the length of plain part Thickness of plates Description of longitudinal joint No. of strengthening rings
 Are the working pressure of furnace by the rules Combustion chamber plates: Material Thickness: Sides Back Top Bottom
 Are the h of stays to ditto: Sides Back Top If stays are fitted with nuts or riveted heads Working pressure by rules
 Are the material of stays Diameter at smallest part Area supported by each stay Working pressure by rules End plates in steam space
 Are the material Thickness Pitch of stays How are stays secured Working pressure by rules Material of stays
 Are the meter at smallest part Area supported by each stay Working pressure by rules Material of Front plates at bottom
 Are the thickness Material of Lower back plate Thickness Greatest pitch of stays Working pressure of plate by rules
 Are the meter of tubes Pitch of tubes Material of tube plates Thickness: Front Back Mean pitch of stays
 Are the thickness across wide water spaces Working pressures by rules Girders to Chamber tops: Material Depth and
 Are the thickness of girder at centre Length as per rule Distance apart Number and pitch of stays in each
 Are the working pressure by rules Steam dome: description of joint to shell % of strength of joint Diameter
 Are the thickness of shell plates Material Description of longitudinal joint Diameter of rivet holes Pitch of rivets
 Are the working pressure of shell by rules Crown plates: Thickness How stayed



REPORT ON MACHINERY.

No. 35880.

SAT. - 8 APR. 1916

Date of writing Report 22.2.16 When handed in at Local Office 10.10.16 Port of Glasgow
 No. in Survey held at Glasgow Date, First Survey 6/2/14 Last Survey 23/3/1916
 Reg. Book. on the H.M.S. "Avenger" (Number of Visits 133)

Master Built at Glasgow By whom built Fairfield S.E.C. 2. (1909) When built 1916
 Engines made at Glasgow By whom made Fairfield S.E.C. 2. (1909) when made 1916
 Boilers made at Renfrew By whom made Batech. Wilson 2. 229 when made 1916
 Registered Horse Power Owners Port belonging to
 Shaft Horse Power at Full Power 14,600 Is Refrigerating Machinery fitted for cargo purposes No Is Electric Light fitted Yes
 SEA - 11,400

TURBINE ENGINES, &c. Description of Engines Geared Turbines (2 sets) No. of Turbines 4
 Diameter of Rotor Shaft Journals, H.P. 4 1/2" L.P. 4 1/2" Diameter of Pinion Shaft 4 1/2"
 Diameter of Journals 4 1/2" Distance between Centres of Bearings 3.3" Diameter of Pitch Circle 9.614"
 Diameter of Wheel Shaft 16" Distance between Centres of Bearings 4.3 1/2" Diameter of Pitch Circle of Wheel 124.42"
 Width of Face 2 1/2" (2) Diameter of Thrust Shaft under Collars 16 3/4" as approved 5-1-14 as per rule 14 1/2"
 No. of Screw Shafts 2 Diameter of same as fitted 14 1/4" Diameter of Propeller 16-0" Pitch of Propeller 15-9"
 No. of Blades 3 State whether Moveable Yes Total Surface 694 Diameter of Rotor (Drum) H.P. 25" L.P. 40" Astern 30"
 Thickness at Bottom of Groove, H.P. Solid L.P. 1 1/2" Astern Solid Revs. per Minute at Full Power, Turbine 1450 Propeller 135

PARTICULARS OF BLADING.

| | H.P. | | | L.P. | | | ASTERN. | | |
|-----------|-------------------|------------------|--------------|-------------------|------------------|--------------|-------------------|------------------|--------------|
| | HEIGHT OF BLADES. | DIAMETER AT TIP. | NO. OF ROWS. | HEIGHT OF BLADES. | DIAMETER AT TIP. | NO. OF ROWS. | HEIGHT OF BLADES. | DIAMETER AT TIP. | NO. OF ROWS. |
| EXPANSION | 15 1/16" | 20 9/16" | 10 | 2 1/4" | 44.44 | 2 | 1 | 31.93 | 4 |
| " | 13 1/16" | 21. 1/16" | 10 | 2 1/16" | 45.305 | 2 | 2 | 33.92 | 4 |
| " | 1 9/16" | 21. 065" | 10 | 3 1/4" | 46.43 | 2 | 4 | 37.91 | 4 |
| " | 1 7/8" | 21.69 | 10 | 4" | 49.93 | 2 | 4 | 37.91 | 4 |
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| " | 2 5/16" | 29.55 | 4 | 6 7/8" | 53.66 | 2 | | | |
| " | 2 7/8" | 30.68 | 4 | 8 1/4" | 56.41 | 2 | | | |
| | 33/8" | 31.68. | 6 | 10" | 59.9 | 2 | | | |
| | 4 1/4" | 33.42 | 6 | 10" | 59.9 | 1 | | | |
| | | | | 10" | 59.9. | 1 | | | |

Bilge Injections 2 sizes 15" Connected to condenser or to circulating pump Is a separate Donkey Suction fitted in Engine Room & size
 Are the bilge suction pipes fitted with roses Yes Are the roses in Engine room always accessible Yes
 Are connections with the sea direct on the skin of the ship Yes Are they Valves or Cocks Both
 Are they sized sufficiently high on the ship's side to be seen without lifting the stokehold plates Yes Are the Discharge Pipes above or below the deep water line Below
 Are they each fitted with a Discharge Valve always accessible on the plating of the vessel Yes Are the Blow Off Cocks fitted with a spigot and brass covering plate Yes
 Are pipes carried through the bunkers None (oil bunkers) How are they protected
 Are Pipes, Cocks, Valves, and Pumps in connection with the machinery and all boiler mountings accessible at all times Yes
 Are Bilge Suction Pipes, Cocks, and Valves arranged so as to prevent any communication between the sea and the bilges Yes
 Are Screw Shaft Tunnel watertight Yes Is it fitted with a watertight door Yes worked from U.E.R. Platform

ERS, &c. (Letter for record 5) Manufacturers of Steel Bolville
 Heating Surface of Boilers 31080 Is Forced Draft fitted Yes No. and Description of Boilers 16 Batech. Wilson Horizontal
 Working Pressure 230 Tested by hydraulic pressure to 460 Date of test No. of Certificate

Are each boiler be worked separately Yes Area of fire grate in each boiler 108.24 No. and Description of Safety Valves to
 Are the boiler Area of each valve Pressure to which they are adjusted 235 lb Are they fitted with easing gear Yes
 Are the smallest distance between boilers or uptakes and bunkers or woodwork Mean dia. of boilers Length Material of shell plates
 Are the thickness Range of tensile strength Are the shell plates welded or flanged Descrip. of riveting: cir. seams
 Are the g. seams Diameter of rivet holes in long. seams Pitch of rivets Lap of plates or width of butt straps
 Are the percentages of strength of longitudinal joint plates Working pressure of shell by rules Size of manhole in shell
 Are the of compensating ring No. and Description of Furnaces in each Boiler Material Outside diameter
 Are the length of plain part Thickness of plates Description of longitudinal joint No. of strengthening rings
 Are the working pressure of furnace by the rules Combustion chamber plates: Material Thickness: Sides Back Top Bottom
 Are the h of stays to ditto: Sides Back Top If stays are fitted with nuts or riveted heads Working pressure by rules End plates in steam space
 Are the material of stays Diameter at smallest part Area supported by each stay Working pressure by rules Material of stays
 Are the material Thickness Pitch of stays How are stays secured Working pressure by rules Material of Front plates at bottom
 Are the meter at smallest part Area supported by each stay Working pressure by rules Working pressure of plate by rules
 Are the thickness Material of Lower back plate Thickness Greatest pitch of stays Working pressure of plate by rules
 Are the meter of tubes Pitch of tubes Material of tube plates Thickness: Front Back Mean pitch of stays
 Are the thickness across wide water spaces Working pressures by rules Girders to Chamber tops: Material Depth and
 Are the thickness of girder at centre Length as per rule Distance apart Number and pitch of stays in each
 Are the working pressure by rules Steam dome: description of joint to shell % of strength of joint Diameter
 Are the thickness of shell plates Material Description of longitudinal joint Diameter of rivet holes Pitch of rivets
 Are the working pressure of shell by rules Crown plates: Thickness How stayed



LR-FAP-TBS-18
SUPERHEATER. Type Balcock-Pulver Date of Approval of Plan 28-1-14 Tested by Hydraulic Pressure to
Date of Test 13-7-15 Is a Safety Valve fitted to each Section of the Superheater which can be shut off from the Boiler
Diameter of Safety Valve 2" Square Pressure to which each is adjusted 240 lbs Is Easing Gear fitted
IS A DONKEY BOILER FITTED? No If so, is a report now forwarded?
SPARE GEAR. State the articles supplied: see separate sheet attached

The foregoing is a correct description,
For THE FAIRFIELD SHIPBUILDING

AND ENGINEERING CO., LIMITED.

Manufacturer.

Alfred Cleghorn

1914. Feb 6. Mar 16. Apr 6. May 27. Jun 21. Jul 4. 10. 11. 15. 25. Aug 9. 30. Sep 5. 10. 12. 19. 24. 31. Oct 3. 7. 14. 17. 21. 28. 31.

Dates of Survey while building
During progress of work in shops -- 29.30. Nov 5. 6. 9. 19. 30. Dec 7. 10. 15. 24. 29. 1915. Jan 5. 6. 20. Feb 9. 16. 15. 23. Mar 5. 10. 18. 23. 26. 30. Apr 12. 13. 16. 19. 26. May 12. 21. 28. 31. Jun 2. 9. 10. 15. 19. 22. 29. Dec 2. 8. 14. 16. 22. 23. 28. 29. 1916. Jan 7. 13. 14. 25. 31. Feb 3. 7. 17. 21. 23. 28. Mar 1. 2. 3. 8. 10. 14. 17. 23.
During erection on board vessel --- 133
Total No. of visits

Is the approved plan of main boiler forwarded herewith Y

" " " donkey " " "

Dates of Examination of principal parts—Casings 5-1-15 Rotors 23-2-15 Blading 30-3-15 Gearing 12-3-15

Rotor shaft 18-3-15 Thrust shaft 7-10-14 Tunnel shafts 7-10-14 Screw shaft 7-10-14 Propeller 5-3-15

Stern tube 23-2-15 Steam pipes tested 5-1-15 Engine and boiler seatings 14-10-14 Engines holding down bolts 13-3-15

Completion of pumping arrangements 14-3-15 Boilers fired 7-2-16 Engines tried under steam 23-3-15

Main boiler safety valves adjusted 23-2-15 Thickness of adjusting washers see separate sheet attached

Material and tensile strength of Rotor shaft Steel H. 34-385mm L.P. 30-355mm Identification Mark on Do. LLOYDS WGM 499

Material and tensile strength of Pinion shaft 9mm 40tons Nickel Steel Identification Mark on Do. LLOYDS WGM 499

Material of Wheel shaft S Identification Mark on Do. LLOYDS WGM 499 Material of Thrust shaft S Identification Mark on Do. LLOYDS WGM 499

Material of Tunnel shafts S Identification Marks on Do. LLOYDS WGM 499 Material of Screw shafts S Identification Marks on Do. LLOYDS WGM 499

Material of Steam Pipes Steel Test pressure 690 lbs

Is an installation fitted for burning oil fuel yes Is the flash point of the oil to be used over 150°F. yes

Have the requirements of Section 49 of the Rules been complied with. yes

Is this machinery a duplicate of a previous case. No If so, state name of vessel ✓

General Remarks (State quality of workmanship, opinions as to class, &c. These Turbines have been built under Special Survey in accordance with the Rules & the workmanship material are of good quality. The Machinery is eligible in my opinion for the records of L.M.C. 3-16 Water tube Boilers subject to Annual Survey & Fitted for Oil Fuel 3-16 F.P. above 150°F.

Sea shaft Horse power 11,700

Shaft Horse power on trial 14,600

It is submitted that this vessel is eligible for THE RECORD + L.M.C. 3.16. F.D.

4 Steam Turbines geared to 2 screw shafts.

Fitted for oil fuel 3.16. F.P. above 150°F.

Water tube Boilers. Subject to Annual Survey.

J.W.D. 13/4/16.

W. Gordon MacIntyre Engineer Surveyor to Lloyd's Register of Shipping.

The amount of Entry Fee ... £ 3 : : : When applied for, 24/3/1916

Special ... £ 68 : 3 : : When received, 10/5/1916

Donkey Boiler Fee ... £ : : : 1/5/16

Travelling Expenses (if any) £ : : : 1/5/16

Committee's Minute GLASGOW 6 APR. 1916

Assigned + L.M.C. 3.16

70 Water Tube Boilers subject to annual survey

Fitted for oil fuel 3.16. F.P. above 150°F.

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