

REPORT ON MACHINERY.

No. 10810 Port of Glasgow TUES. 14
 Received at London Office
 No. in Survey held at Glasgow Date, first Survey 2nd Sept 1890 Last Survey 14th July 1891.
 Reg. Book. on the S S Harwarden Castle (Number of Visits 144)
 Master R. Duncan Built at Glasgow By whom built J. Elder & Co Tons Gross 4380
 Engines triple at Glasgow By whom made The Fairfield Ship & Engine Co. Ltd when made 1891 Net 2556
 Boilers made at Glasgow By whom made Do when made 1891 When built 1883
 Registered Horse Power 850 Owners D. Irvine & Co Port belonging to London

ENGINES, &c.

Description of Engines Inverted Direct Acting - Triple Expansion. No. of Cylinders Three
 Diam. of Cylinders 37, 60 $\frac{1}{2}$, 96 Length of Stroke 60 Rev. per minute 75 Point of Cut off, High Pressure same Low Pressure
 Diameter of Screw shaft 18 Diam. of Tunnel shaft 17 Diam. of Crank shaft journals 18 Diam. of Crank pin 18 $\frac{1}{2}$ size of Crank webs 13 $\frac{1}{2}$
 Diameter of screw 18-6 Pitch of screw 23-0 No. of blades Four state whether moveable yes total surface 100 sq ft
 No. of Feed pumps Two diameter of ditto 6 Stroke 25 Can one be overhauled while the other is at work yes
 No. of Bilge pumps Two diameter of ditto 6 Stroke 25 Can one be overhauled while the other is at work no
 Where do they pump from Three suction in Engine Room, Two in aft press bunker, three in stokehold, one in Fore cross bunker & hold.
 No. of Donkey Engines Three Size of Pumps 110 pump & 24 stroke - 8 gals Where do they pump from Meas from heater, bottom of condenser and hotwell. Feed donkey from engine & boiler space & holds, sea, tanks & condenser. Bilge donkey from sea, bilge & condenser.
 Are all the bilge suction pipes fitted with roses yes Are the roses always accessible yes Are the sluices on Engine room bulkheads always accessible yes
 No. of bilge injections Two and sizes 15 dia. Are they connected to condenser, or to circulating pump Circulating
 How are the pumps worked Two centrifugal circulating pumps. The others from crosshead of Low & M. Engines
 Are all connections with the sea direct on the skin of the ship yes Are they Valves or Cocks Both.
 Are they fixed 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 Above
 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
 What pipes are carried through the bunkers For suction How are they protected Wood casing.
 Are all pipes, cocks, valves, and pumps in connection with the machinery accessible at all times yes
 Are the pipes, cocks, and valves arranged so as to prevent an unintentional connection between the sea and the bilges yes
 When were stern tube, propeller, screw shaft, and all connections examined in dry dock Examined in Dry Dock.
 Is the screw shaft tunnel watertight yes and fitted with a sluice door yes worked from Deck.

BOILERS, &c.

No. of Boilers Three Description Cylindrical - Melt. Material Steel Letter (for record)
 Working Pressure 160 lbs Tested by hydraulic pressure to 320 lbs Date of test 14th + 22nd May + 4th June
 Description of superheating apparatus or steam chest None
 Can each boiler be worked separately yes Can the superheater be shut off and the boiler worked separately yes
 No. of square feet of fire grate surface in each boiler 132 $\frac{1}{2}$ Description of safety valves Direct spring No. to each boiler Two
 Area of each valve 14.15 sq ins are they fitted with easing gear yes No. of safety valves to superheater 1 area of each valve 1
 Are they fitted with easing gear yes Smallest distance between boilers and bunkers or woodwork No side bunkers Diameter of boilers 14-9"
 Length of boilers 19-2" description of riveting of shell long. seams Butt three rows circum. seams Laps - centre tube Thickness of shell plates 1 $\frac{9}{32}$
 Diameter of rivet holes 1 $\frac{5}{16}$ whether punched or drilled Drilled. pitch of rivets 8 $\frac{7}{8}$, 6 $\frac{3}{16}$ & 4 $\frac{7}{16}$ Lap of plating 19 $\frac{1}{2}$ butt chop
 Percentage of strength of longitudinal joint 85.2 working pressure of shell by rules 160 size of manholes in shell
 Size of compensating rings No. of Furnaces in each boiler Three Description of Furnaces Purvis' patent ribbed.
 Outside diameter 44" length 7-0 inches thickness of plates $\frac{1}{2}$ " description of joint Weld if rings are fitted yes
 Greatest length between rings 9" working pressure of furnace by the rules 158 lbs combustion chamber plating, thickness, sides $\frac{9}{16}$ back $\frac{9}{16}$ top $\frac{19}{16}$
 Pitch of stays to ditto, sides 7 $\frac{1}{4}$ + 7 $\frac{3}{4}$ back 7 $\frac{3}{4}$ top 7 $\frac{1}{4}$ + 7 $\frac{3}{4}$ If stays are fitted with nuts or riveted heads Nuts working pressure of plating by rules 162 lbs
 Diameter of stays at smallest part 1 $\frac{3}{8}$ inches working pressure of ditto by rules 164 lbs end plates in steam space, thickness 1 $\frac{1}{16}$ "
 Pitch of stays to ditto 15 + 15 1 $\frac{1}{2}$ inch thread. how stays are secured Nuts working pressure by rules 179 lbs diameter of stays at smallest part 2 $\frac{3}{8}$ inches working pressure by rules 175 lbs Front plates at bottom, thickness $\frac{3}{4}$ " Back plates, thickness ✓
 Greatest pitch of stays ✓ working pressure by rules ✓ Diameter of tubes 3 $\frac{1}{4}$ " pitch of tubes 4 $\frac{1}{2}$ " thickness of tube plates, front $\frac{3}{4}$ " back $\frac{3}{4}$ " how stayed Tubes pitch of stays 14 $\frac{1}{2}$ + 9 width of water spaces 4 to 6
 Diameter of Superheater or Steam chest None length ✓ thickness of plates ✓ description of longitudinal joint ✓ diam. of rivet holes ✓
 Pitch of rivets ✓ working pressure of shell by rules ✓ diameter of flue ✓ thickness of plates ✓ If stiffened with rings ✓
 Distance between rings ✓ working pressure by rules ✓ end plates of superheater, or steam chest; thickness ✓ how stayed ✓
 Superheater or steam chest; how connected to boiler ✓

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DONKEY BOILER— Description *Cylindrical - Mult*
 Made at *Glasgow* by whom made *L. Burnett & Co* when made *1891* where fixed *In Hold*
 Working pressure *80 lb* tested by hydraulic pressure to *160* No. of Certificate *2976* fire grate area *28 sq ft* description of safety
 valves *Direct spring* No. of safety valves *4* area of each *7 sq ins* if fitted with easing gear *Yes* if steam from *other* boilers can
 enter the donkey boiler *No* diameter of donkey boiler *10-6* length *8-0* description of riveting *Lap three rows*
 Thickness of shell plates *19/32* diameter of rivet holes *15/16* whether punched or drilled *Filled* pitch of rivets *1 1/4* lap of plating *6 1/2*
 per centage of strength of joint thickness of plates *3/8* stayed by *Iron stay 2" dia. 15" pitch*
 Diameter of furnace *34 3/4* bottom *✓* length of furnace *5-9* thickness of plates *1/8* description of joint *Unriveted*
 Thickness of *crank cham* furnace crown plates *1/16* stayed by *1 1/2" steel stay 7 3/4" 7 3/4"* working pressure of shell by rules *84 lb*
 Working pressure of furnace by rules *130 lb* diameter of *water tubes* *3 1/2* thickness of plates *5/8* thickness of water tubes *✓*

SPARE GEAR. State the articles supplied:— *Two top & two bottom end connecting rod bolts - Four main bearing bolts - One dozen coupling bolts - Two feed & two bilge pump valves - One guide shoe - One propeller shaft complete - One propeller boss & blades - One stem bush with wood complete - One third part crank shaft - Piston rings for H.P. & M.P. pistons - Air pump rod, bucket & head & foot valves - The foregoing is a correct description, three feed & bilge pump plungers -*
 Manufacturer.

General Remarks (State quality of workmanship, opinions as to class, &c.)
The boilers have been constructed under special survey - they are of good material & workmanship - they have been well fitted on board, satisfactorily tested under steam at 160 lb per square to which the safety valves have been adjusted -
The engines were entirely removed from the vessel to the shops where they were re-erected - Among the old parts overhauled and again fitted on board are the tunnel blocks, which were refilled with white metal - the low pressure crank shaft - the air pumps - the main engine bilge pumps - the bilge donkey - the centrifugal pumps for circulating - the bilge injection chests, pipes & crosses - Main injection valves - Discharge valves -
Among the new parts are the H. P. columns & soleplate - the thrust block - main feed pumps - Water pump & a duplex pump - New tunnel & propeller shafts -
All the steam pipes & connections to the boilers are new -
When the vessel was in Dry Dock all the sea cocks & valves were overhauled and new donkey suction & blow off cocks fitted - new anchors for duplex donkey - new ash cock at Fore end of stokehold - new Demlops governor - and new freezing machine suction and discharge -
All the work in connection with the overhaul of the engines has been well carried out and the engines have been satisfactorily tried under steam -
*We are of opinion the machinery is now in good & safe working condition and eligible to be classed **L.M.C. 7-91** in the Register Book with the notification **+NB 91.***

It is submitted that this vessel is eligible to have +NB.91 +L.M.C. 7.91. and triple 91 recorded

*W.A.
20-7-91*

The amount of Entry Fee .. £ : received by me,
 Special £ *2* :
 Main Donkey Boiler Fee £ *21* :
 Certificate (if required) .. £ :
 To be sent as per margin.
 (Travelling Expenses, if any, £)

*M.P.H.
26.8.91
30.7.91
J.R. Robson - J.M. Anderson
Engineer Surveyor to Lloyd's Register of British & Foreign Shipping.*

Committee's Minute **TUES. 21 JUL 1891**

+NB91 +Lmb 7/91 Triple 91

Letter to Glasgow 15/7/91

