

No. 2225

*R.H. Marshall
Stm Reap.*

THE BRITISH CORPORATION FOR THE SURVEY
AND
REGISTRY OF SHIPPING.

Report No. *2244* No. in Register Book *3628*

S.S. "*Joseph P. Burke*"

Makers of Engines *Swan Hunter & W.R. Ltd.*

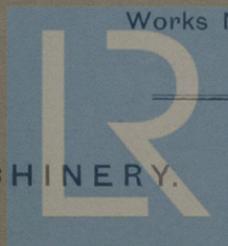
Works No. *1330.*

Makers of Main Boilers *Swan Hunter & W.R. Ltd.*

Works No. *1330.*

Makers of Donkey Boiler *None*

Works No. *2020*



Lloyd's Register
Foundation

74 003556-003566-0147

No.

THE BRITISH CORPORATION FOR THE SURVEY

AND

REGISTRY OF SHIPPING.

Report No. No. in Register Book

Received at Head Office

24th February 1930.

Surveyor's Report on the New Engines, Boilers, and Auxiliary
Machinery of the ^{Single Triple} ~~Twin Quadruple~~ Screw "Joseph P. Burke"

Official No. 149499 Port of Registry Newcastle.

Registered Owners Sarnia Steamships Ltd.
Sarnia, Ontario.

Engines Built by Swan Hunter & W.R. Ltd.

at Walker.

Main Boilers Built by Swan Hunter & W.R. Ltd.

at Walker.

Donkey

none fitted.

at

Date of Completion

4th April 1929.

First Visit

13th Sept 1928.

Last Visit

11. 4. 29.

Total Visits

56.

RECIPROCATING ENGINES.

Works No. 1330 No. of Sets One Description Triple expansion surface condensing.

No. of Cylinders each Engine Three No. of Cranks Three
 Diars of Cylinders Three 15", 25" & 40" Stroke 33"
 Cubic feet in each L.P. Cylinder 24.

Are Spring-loaded Relief Valves fitted to Top and Bottom of each Cylr.?

" " each Receiver? Yes

Type of H.P. Valves, Piston Valve.

1st L.P. ,, Tric Valve.

2nd L.P. ,,

L.P. ,, Double ported slide.

" Valve Gear Stephenson Link.

" Condenser Circular 2 flow. Cooling Surface 400 sq. ft.

Diameter of Piston Rods (plain part) Screwed part (bottom of thread)

Material ,,

Diar. of Connecting Rods (smallest part) Material

" Crosshead Gudgeons Length of Bearing Material

No. of Crosshead Bolts (each) Diar. over Thrd. Thrds. per inch Material

" Crank Pin " " " "

" Main Bearings Lengths

" Bolts in each Diar. over Thread Threads per inch Material

" Holding Down Bolts, each Engine 61 Diar. 1 1/4" No. of Metal Chocks 61.

Are the Engines bolted to the Tank Top or to a Built Seat?

Are the Bolts tapped through the Tank Top and fitted with Nuts Inside?

If not, how are they fitted?

Connecting Rods, Forged by

Piston " "

Crossheads, " "

Connecting Rods, Finished by

Piston " "

Crossheads, " "

Date of Harbour Trial

" Trial Trip

Trials run at

Were the Engines tested to full power under Sea-going conditions? Yes.

If so, what was the L.H.P.?

Pressure in 1st L.P. Receiver, 1/2 lbs., 2nd L.P., 10 lbs., L.P., 10 lbs., Vacuum, 25 1/2 ins.

Speed on Trial 8.9

If the Conditions on Trial were such that full power records were not obtained give the following estimated

data:—

Builders' estimated L.H.P. ✓

Estimated Speed ✓

This machinery is a duplicate of that numbered 1334 and fitted in No 1369 (s/s John O. McKellar) building at the same time and the details of which are similar unless otherwise stated.



Lloyd's Register Foundation

TURBO-ELECTRIC PROPELLING MACHINERY.

No. of Turbo-Generating Sets

Capacity of each

Type of Turbines employed

Description of Generators

No. of Motors driving Propeller Shafting

Are the Propeller Shafts driven direct by the Motors or through Gearing?

Is Single or Double Reduction Gear employed?

Description of Motors

Diam. of 1st Reduction Pinion

Width

Pitch of Teeth

" 1st " Wheel

Estimated Pressure per lineal inch

Diam. of 2nd Reduction Pinion

Width

Pitch of Teeth

" 2nd " Wheel

Estimated Pressure per lineal inch

Revs. per min. of Generators at Full Power

" " Motors "

" " 1st Reduction Shaft

" " 2nd "

" " Propellers at Full Power

Total Shaft Horse Power

Date of Harbour Trial

" Trial Trip

Trials run at

Speed on Trial

Knots. Propeller Revs. per min.

S.H.P.

Makers of Turbines

" Generators

" Motors

" Reduction Gear

Turbine Spindles forged by

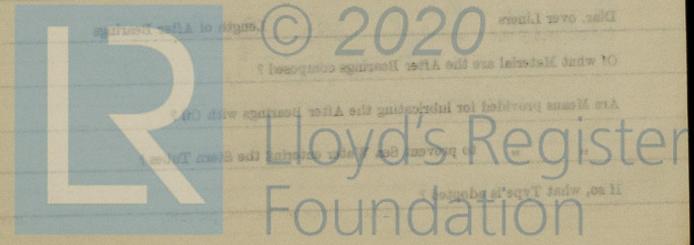
" Wheels forged or cast by

Reduction Gear Shafts forged by

" Wheels forged or cast by

DESCRIPTION OF INSTALLATION.

Multiple-Collar Morse shoe
 Type of Thrust Blocks
 No. of Rings
 Diam. of Thrust Shafts at bottom of Collars
 Forward Coupling
 No. of Collars
 AS AS Coupling
 Diam. of Intermediate Shafting by Rule
 Action
 No. of Lineal
 No. of Holes, each Coupling
 Diam. at Mid Length
 Diam. of Pinion Gears
 AS Couplings
 Action
 Diam. of Propeller Shafts by Rule
 Are Propeller Shafts fitted with Condenser Thrust Liners?
 Diam. over Liners
 On what Material are the Aft Bearings cast?
 Are Means provided for indicating the Aft Bearings with Oil?
 Do Bearings have means for showing the Steam Temperature?
 Is the Aft Type of Bearings?



SHAFTING.

Are the Crank Shafts Built or Solid?

Built.

No. of Lengths in each

Angle of Cranks

Diar. by Rule

Actual

In Way of Webs

" of Crank Pins

Length between Webs

Greatest Width of Crank Webs

Thickness

Least " "

Diar. of Keys in Crank Webs

Length

" Dowels in Crank Pins

Length

Screwed or Plain

No. of Bolts each Coupling

Diar. at Mid Length

Diar. of Pitch Circle

Greatest Distance from Edge of Main Bearing to Crank Web

Type of Thrust Blocks

Multi-collar Horse shoe.

No. " Rings

Diar. of Thrust Shafts at bottom of Collars

No. of Collars

" " Forward Coupling

At Aft Coupling

Diar. of Intermediate Shafting by Rule

Actual

No. of Lengths

No. of Bolts, each Coupling

Diar. at Mid Length

Diar. of Pitch Circle

No intermediate shafting.

Diar. of Propeller Shafts by Rule

Actual

At Couplings

Are Propeller Shafts fitted with Continuous Brass Liners?

Diar. over Liners

Length of After Bearings

Of what Material are the After Bearings composed?

Are Means provided for lubricating the After Bearings with Oil?

" " to prevent Sea Water entering the Stern Tubes?

If so, what Type is adopted?

SKETCH OF CRANK SHAFT.

See *s/s Kingdoe.**Swan Hunter No 1236 Eng., built 1927.*

form given below Material

Steel can of bottom

propeller shaft

have

form given below

Swan Hunter No 1236

STAMP MARKS ON SHAFTS.

Crank shaft

88 P. 18. 18. 28

7.1. 4. 12. 28

propeller shaft

88 P. 18. 21. 28

7.1. 4. 12. 28



© 2020 Lloyd's Register Foundation

No. of Blades each Propeller

Ritted or Solid?

Material of Blades

Boss

Diam. of Propellers

Pitch

Surface (each

S. ft.)

Coefficient of Displacement of Vessel at $\frac{1}{2}$ Moulded Depth

Crank Shafts Forged by

Material

,, Pins

,, Webs

Thrust Shafts

Intermed. ,,

Propeller ,,

Crank ,, Finished by

Thrust ,,

Intermed. ,,

Propeller ,,

John Spencer & Son

Steel

Steel Coy of Scotland

John Spencer & Sons

none

John Spencer & Sons

Swan Hunter & W.R. Ltd.

STAMP MARKS ON SHAFTS.

Crank Shaft. 389 G.H.B. 18.9.28
J.L. 4.12.28.Thrust Shaft. 392 G.H.B. 21.9.28.
J.L. 4.12.28.Propeller Shaft. 392 G.H.B.
J.L. 4.12.28.

SKETCH OF PROPELLER SHAFT.

See 2/5 Kingdoc

Sug No 1236

built 1927.

SKETCH OF SHEET PUMPS, ETC.

No. of Air Pumps *One* Diar. Stroke

Worked by Main or Independent Engines? *See the kind of pump*

No. of Circulating Pumps *One* Diar. Stroke

Type of " *Dawson & Downie Simplex.*

Diar. of " Suction from Sea

Has each Pump a Bilge Suction with Non-return Valve? Diar.

What other Pumps can circulate through Condenser? *Ballast pump.*

No. of Feed Pumps on Main Engine Diar. Stroke

Are Spring-loaded Relief Valves fitted to each Pump?

Can one Pump be overhauled while the others are at work?

No. of Independent Feed Pumps Diar. Stroke

What other Pumps can feed the Boilers? *General Service pump and injector.*

No. of Bilge Pumps on Main Engine Diar. Stroke

Can one Pump be overhauled while the others are at work?

No. of Independent Bilge Pumps

What other Pumps can draw from the Bilges? *Circulating pump and ballast pump.*

Are all Bilge Suctions fitted with Roses? *Yes. or mudboxes.*

Are the Valves, etc., so arranged as to prevent unintentional connection between Sea and Bilges?

Are all Sea Connections made with Valves or Cocks next the Ship's sides?

Are they placed so as to be easily accessible?

Are the Discharge Chests placed above or below the Deep Load Line?

Are they fitted direct to the Hull Plating and easily accessible?

Are all Blow-off Cocks or Valves fitted with Spigots through the Hull Plating and Covering Plates or Flanges on the Outside?

BOILERS

Works No. *1330*

No. of Boilers *Two*

Type *Simplex - vertical*

Single or Double-ended *out*

No. of Furnaces in each *two*

Type of Furnaces *Highland*

Date when Plan approved *31.8.28*

Approved Working Pressure *180 lb sq in*

Hydraulic Test Pressure *220 lb sq in*

Date of Hydraulic Test *4.2.29*

" when Safety Valves set *21.3.29*

Pressure at which Valves were set *182 lb sq in*

Date of Accumulation Test *at accumulation*

Maximum Pressure under Accumulation Test

System of Draught *Horizontal forced draught. C.A.*

Can Boilers be worked separately? *Yes.*

Names of Plates *Shell of boiler*

No. of Plates

Material *Riveted, mild steel, rivets*

Pressure *inside boiler water*



© 2020

Lloyd's Register Foundation

BOILERS.

Works No. 1330.

No. of Boilers Two Type Cylindrical Multitubular

Single or Double-ended Single-ended.

No. of Furnaces in each Two.

Type of Furnaces Deighton.

Date when Plan approved 31.8.28

Approved Working Pressure 180 lbs. sq. in.

Hydraulic Test Pressure 320 lbs. sq. in.

Date of Hydraulic Test 7.2.29.

" when Safety Valves set 21.3.29.

Pressure at which Valves were set 185 lbs. sq. in.

Date of Accumulation Test No accumulation.

Maximum Pressure under Accumulation Test ✓

System of Draught Howden's Forced draught. C.A.

Can Boilers be worked separately? Yes.

Makers of Plates Steel Coy of Scotland

" Stay Bars

" Rivets Rivet, Bolt & Nut Coy.

" Furnaces Broomside Boiler works. @

Greatest Internal Diam. of Boilers

" " Length "

Square Feet of Heating Surface each Boiler

" " Grate " "

No. of Safety Valves each Boiler Rule Diam. Actual

Are the Safety Valves fitted with Easing Gear?

No. of Pressure Gauges, each Boiler No. of Water Gauges

" Test Cocks " " Salinometer Cocks



© 2020

Lloyd's Register
Foundation

Are the Water Gauges fitted direct to the Boiler Shells or mounted on Pillars?

Are the Water Gauge Pillars fitted direct to the Boiler Shells or connected by Pipes?

Are these Pipes connected to Boilers by Cocks or Valves?

Are Blow-off Cocks or Valves fitted on Boiler Shells?

No. of Strakes of Shell Plating in each Boiler

Plates in each Strake

Thickness of Shell Plates Approved

in Boilers

Are the Rivets Iron or Steel?

Are the Longitudinal Seams Butt or Lap Joints?

Are the Butt Straps Single or Double?

Are the Double Butt Straps of equal width?

Thickness of outside Butt Straps

inside

Are Longitudinal Seams Hand or Machine Riveted?

Are they Single, Double, or Treble Riveted?

No. of Rivets in a Pitch

Diam. of Rivet Holes Pitch

No. of Rows of Rivets in Centre Circumferential Seams

Are these Seams Hand or Machine Riveted?

Diam. of Rivet Holes Pitch

No. of Rows of Rivets in Front End Circumferential Seams

Are these Seams Hand or Machine riveted?

Diam. of Rivet Holes Pitch

No. of Rows of Rivets in Back End Circumferential Seams

Are these Seams Hand or Machine Riveted?

Diam. of Rivet Holes Pitch

Size of Manholes in Shell

Dimensions of Compensating Rings

Multitubular

Height

1 1/2"

20 lbs

320 lbs

24

21 1/2"

24 lbs

to specification

Hand

Thickness of Shell Plates in Steam Space Approved

in Boilers

Pitch of Steam Space Plates

Dist. of Gears & Approved

in Boilers

Material of

How are Gears secured?

Dist. and Thickness of Loose Washers on Gear Faces

Divided

With

Thickness of Middle Back End Flange Approved

in Boilers

Thickness of Flange in Wide Spaces between Pipes

Pitch of Gears

Dist. of Gears & Approved

in Boilers

Material

Are Gears fixed with Nuts outside?

Thickness of Back End Flange at Bottom Approved

in Boilers

Pitch of Gears in Wide Spaces between Pipes

Thickness of Gears

Thickness of Front End Flange at Bottom Approved

in Boilers

No. of Longitudinal Strakes in Steam Space



© 2020 Lloyd's Register Foundation

Are the Water Spaces fitted Back to the Boiler Shell or connected by Pipes?
Thickness of End Plates in Steam Space Approved

" " " " " in Boilers

Pitch of Steam Space Stays

Diar. " " " " Approved Threads per Inch

" " " " in Boilers "

Material of " " "

How are Stays Secured?

Diar. and Thickness of Loose Washers on End Plates

" " Riveted " "

Width " " Doubling Strips "

Thickness of Middle Back End Plates Approved

" " " " " in Boilers

Thickness of Doublings in Wide Spaces between Fireboxes

Pitch of Stays at " " " "

Diar. of Stays Approved Threads per Inch

" " in Boilers "

Material "

Are Stays fitted with Nuts outside?

Thickness of Back End Plates at Bottom Approved

" " " " " in Boilers

Pitch of Stays at Wide Spaces between Fireboxes

Thickness of Doublings in " "

Thickness of Front End Plates at Bottom Approved

" " " " " in Boilers

No. of Longitudinal Stays in Spaces between Furnaces



© 2020

Lloyd's Register Foundation

Diar. of Stays Approved Threads per Inch

" " in Boilers

Material "

Thickness of Front Tube Plates Approved

" " " " in Boilers

Pitch of Stay Tubes at Spaces between Stacks of Tubes

Thickness of Doublings in " " "

" Stay Tubes at " " "

Are Stay Tubes fitted with Nuts at Front End ?

Thickness of Back Tube Plates Approved

" " " in Boilers

Pitch of Stay Tubes in Back Tube Plates

" Plain "

Thickness of Stay Tubes

" Plain "

External Diar. of Tubes

Material "

Thickness of Furnace Plates Approved

" " " in Boilers

Smallest outside Diar. of Furnaces

Length between Tube Plates

Width of Combustion Chambers (Front to Back)

Thickness of " " Tops Approved

" " " " in Boilers

Pitch of Screwed Stays in C.C. Tops

Diars. of Screwed Stays Approved Threads per Inch

" " " in Boilers

Material "

Thickness of Combustion Chamber Sides Approved

" " " in Boilers

Pitch of Screwed Stays in C.C. Sides

Diars. " " Approved Threads per Inch

" " " in Boilers

Material "

Thickness of Combustion Chamber Backs Approved

" " " in Boilers

Pitch of Screwed Stays in C.C. Backs

Diars. " " Approved Threads per Inch

" " " in Boilers

Material "

Are all Screwed Stays fitted with Nuts inside C.C. ?

Thickness of Combustion Chamber Bottoms

No. of Girders over each Wing Chamber

" " Centre

Depth and Thickness of Girders

Material of Girders

No. of Stays in each

No. of Tubes each boiler

Diars. of Tubes



© 2020

Lloyd's Register Foundation

Threads per Inch

Diar. of Screwed Stays Approved

" " " in Boilers

Material " "

Thickness of Combustion Chamber Sides Approved

" " " " in Boilers

Pitch of Screwed Stays in C.O. Sides

Threads per Inch

Approved

Diar. " " " in Boilers

Material " "

Thickness of Combustion Chamber Backs Approved

" " " " in Boilers

Pitch of Screwed Stays in C.O. Backs

Threads per Inch

Approved

Diar. " " " in Boilers

Material " "

Are all Screwed Stays fitted with Nuts inside C.O.?

Thickness of Combustion Chamber Bottoms

No. of Girders over each Wing Chamber

" " " Centre "

Depth and Thickness of Girders

Material of Girders

No. of Stays in each

No. of Tubes, each Boiler

Size of Lower Manholes

VERTICAL DONKEY BOILERS

No. of Boilers

Type

Greatest Int. Diar.

Height

Height of Boiler Crown above Fire Grate

Are Boiler Crowns Flat or Dished?

Internal Radius of Dished Ends

Thickness of Plates

Description of Seams in Boiler Crown

Diar. of Rivet Hole

Pitch

Width of Overlap

Height of Firebox Crown above Fire Grate

Are Firebox Crowns Flat or Dished?

External Radius of Dished Crowns

Thickness of Plates

No. of Crown Stays

Diar.

Material

External Diar. of Firebox at Top

Bottom

Thickness of Plates

No. of Water Tubes

Int. Diar.

Thickness

Material of Water Tubes

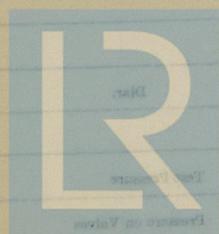
Size of Manhole in Shell

Dimensions of Compensating Ring

Leaking Surface each Boiler

Grate Surface

SUPERHEATERS



© 2020

Lloyd's Register
Foundation

VERTICAL DONKEY BOILERS.

No. of Boilers Type

Greatest Int. Diar. Height

Height of Boiler Crown above Fire Grate

Are Boiler Crowns Flat or Dished ?

Internal Radius of Dished Ends Thickness of Plates

Description of Seams in Boiler Crowns

Diar. of Rivet Holes Pitch Width of Overlap

Height of Firebox Crowns above Fire Grate

Are Firebox Crowns Flat or Dished ?

External Radius of Dished Crowns Thickness of Plates

No. of Crown Stays Diar. Material

External Diar. of Firebox at Top Bottom Thickness of Plates

No. of Water Tubes Ext. Diar. Thickness

Material of Water Tubes

Size of Manhole in Shell

Dimensions of Compensating Ring

Heating Surface, each Boiler Grate Surface

SUPERHEATERS.

Description of Superheaters

Where situated ?

Which Boilers are connected to Superheaters ?

Can Superheaters be shut off while Boilers are working ?

No. of Safety Valves on each Superheater Diar.

Are " " fitted with Easing Gear ?

Date of Hydraulic Test Test Pressure

Date when Safety Valves set Pressure on Valves

MAIN STEAM PIPES.

No. of Pipes

Material

Internal Diameter or Diameter

Internal Diameter

Thickness

Date and Hydraulic Test

Date of Hydraulic Test

Test Pressure

No. of Pipes

Material

Internal Diameter or Diameter

Internal Diameter

Thickness

Date and Hydraulic Test

Date of Hydraulic Test

Test Pressure



© 2020

Lloyd's Register
Foundation

MAIN STEAM PIPES.

No. of Lengths

3.

Material

Steel.

Brazed, Welded or Seamless

Seamless.

Internal Diam.

3½"

Thickness

¼"

How are Flanges secured?

Screwed.

Date of Hydraulic Test

8.3.29.

Test Pressure

540 lbs.

No. of Lengths

Material

Brazed, Welded or Seamless

Internal Diam.

Thickness

How are Flanges secured?

Date of Hydraulic Test

Test Pressure

SUPERHEATERS.

No. of Lengths

Material

Brazed, Welded or Seamless

Internal Diam.

Thickness

How are Flanges secured?

Date of Hydraulic Test

Test Pressure

LIST OF PUMPS

EVAPORATORS
 Same as John O'Connell No. 364
 1884
 1884
 1884

FEED WATER HEATERS

No. One
 180 lbs.
 18.12.28
 180 lbs.
 18.12.28

FEED WATER FILTERS

No. One
 180 lbs.
 18.12.28
 180 lbs.
 18.12.28



© 2020

Lloyd's Register
Foundation

Positions of Auxiliary Switch Boards, with No. of Switches on each

Location of Main Switch Board	No. of Circuits to which switches are provided on Main Switch Board	Location of Dynamometer	Single or Double Wire System	Current Alternating or Continuous	Capacity	Dimensions of Dynamometer	No. and Description of Dynamos	Installation Fitted by
On Main Switch Board	10	On Main Switch Board	Double Wire	Continuous	110 Volts	380 Watts per Min	See Appendix	See Appendix

Are Out-outs fitted as follows?—

On Main Switch Board, to Cables of Main Circuits

On Aux. " " each Auxiliary Circuit

Wherever a Cable is reduced in size

To each Lamp Circuit

To both Flow and Return Wires of all Circuits when the Double-Wire System is adopted

Are the Fuses of Standard Sizes?

Are all Switches and Out-outs constructed of Non-inflammable Material?

Are they placed so as to be always and easily accessible?

Smallest Single Wire used, No. S.W.G., Largest, No. S.W.G.

How are Conductors in Engine and Boiler Spaces protected?

" " Saloons, State Rooms, &c., " ?

What special protection is provided in the following cases?—

(1) Conductors exposed to Heat or Damp

(2) " " passing through Bunkers or Cargo Spaces

(3) " " Deck Beams or Bulkheads

Are all Joints in Cables properly soldered and thoroughly Insulated so that the efficiency of the Cables is unimpaired?

Are all Joints in accessible positions, none being made in Bunkers or Cargo Spaces?

Are all Hull Connections for Single-Wire Systems made with Screws of large Surface?

Are the Dynamos, Motors, Main and Branch Cables, so placed that the Compasses are not injuriously affected by them?

Have Tests been made to prove that this condition has been satisfactorily fulfilled?

Has the Insulation Resistance over the whole system been tested? Yes.

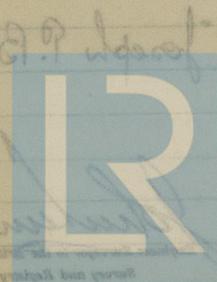
What does the Resistance amount to? 400000 Ohms.

Is the Installation supplied with a Voltmeter? Yes.

" " " an Ampere Meter Yes.

Date of Trial of complete Installation 21.3.29. Duration of Trial 6 hours.

Have all the requirements of Section 42 been satisfactorily carried out? Yes.



Lloyd's Register Foundation

GENERAL CONSTRUCTION.

Have the Machinery and Boilers been constructed in accordance with the requirements of the Rules and the

Approved Plans? *Yes*

If not, give details of the points of difference, and state when these were sanctioned by the Chief

Surveyor. *Yes*

Are the Materials used in the Construction of Engines and Boilers, so far as could be seen, sound and

trustworthy? *Yes*

Is the Workmanship throughout thoroughly satisfactory? *Yes*

The above correctly describes the Machinery of the S.S.

as ascertained by *me* from personal examination

Joseph P. Burke

John Lundgren
 Engineer-Surveyor to the British Corporation for the
 Survey and Registry of Shipping.

Fees—

MAIN BOILERS.		£	s.	d.
H.S.	Sq. ft.	:	:	:
G.S.	"	:	:	:
DONKEY BOILERS.				
H.S.	Sq. ft.	:	:	:
G.S.	"	:	:	:
		£	:	:
ENGINES.				
L.P.O.	Cub. ft.	:	:	:
		£	:	:
Testing, &c. ...		:	:	:
		£	:	:
Expenses ...		:	:	:
Total ...		£	:	:

It is submitted that this Report be approved,

Joe Barr for Chief Surveyor.

Approved by the Committee for the Class of M.B.S.* on the *23rd December 1929*

Fees advised

Fees paid



© 2020

Lloyd's Register
 Foundation
 Secretary.

GENERAL CONSTRUCTION

MAINTENANCE	
H.S.	Sp. R.
G.S.	"
DOCKET HOLDERS	
H.S.	Sp. R.
G.S.	"
ENGINEERS	
L.P.C.	Cap. R.
Testing &c.	
Expenses	
Total	

It is submitted that this Report be approved.

Approved by the Committee for the Class of M.B.S. on the 22nd December 1921

John P. Burke
Chairman

John P. Burke

John P. Burke
Chairman



© 2020

Lloyd's Register Foundation



© 2020

Lloyd's Register
Foundation



© 2020

Lloyd's Register
Foundation



© 2020

Lloyd's Register
Foundation