

Report No. V/1246.

DUPLICATE

THE BRITISH CORPORATION REGISTER OF SHIPPING AND AIRCRAFT MACHINERY

No. in Reg. Book

Port Bombay, (INDIA).

S.S. " GLADYS MOLLER "

8th March, 1949.

Survey held*

Owners Electric Lighting? Kws.

Engines:

Description Made by When

Cylinders, No. each Eng. Diars. Store Cub. Ft. each L.P. Cyl.

Boilers:

Main. No. & Description W. P. Made by When

Aux. M. Do. W. P. Made by When

Donkey W. P. Made by When

Main Steam Pipes, Material Welded, Brazed, Seamless When Tested

Propeller Shaft, Diar, under, Liner Description of Liner When Drawn

Class M.B.S. S.S. No. Due Boiler Survey Due M. S. Due

*Insert name of Dry Dock ; or where, if afloat.

The undersigned, W.R. WISHART, Engineer Surveyor to this Corporation, did, at the request of Messrs. James Finlay & Co., Ltd., Agents for the concerned, attend on board the above named vessel on 14-4-48 as she lay afloat at No. 20 Alexandra Dock, and subsequently as she lay afloat in the Harbour at Bombay for the purpose of examining the damaged condition of the Main Propulsion Generator and Turbine, stated to have been caused by the Turbine overspeeding. For further particulars see Vessel's Log Book.

Upon examination the undersigned

FOUND.

RECOMMENDED.

Generator Stator.

Coils torn out & twisted.

To be completely rewound.

Generator Rotor.

Retaining bands burst off, coils displaced & torn, Rotor body damaged.

To be renewed.

at Visit 14-4-48. Last Visit 28-2-49. Boilers and Engines then in ---OVER--- Condition

of Visits 23.

Rs. 1,300/-. Advised

Rs. 90/-. Paid

Rs. 1,390/-.

W.R. Wishart

Eng. Surveyor to the British Corporation Register of Shipping and Aircraft.



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On completion of the foregoing, the turbine rotor was found to be a substance, as above, but was in all probability Boiler Compound carried over to the turbine, when the Main Boilers primed immediately prior to the accident. The Rotor was lifted, and Rotor, Stator, etc., cleaned for examination. After cleaning, the Rotor blades still contained a certain amount of dirt and scale, although smooth on their surfaces and were examined in this condition.

The H.P. end contains four wheels, the first of which is Compound.

About 25% of the blades on each of these wheels were found to be slightly pitted on the outside, the affected blades being grouped together and the pitted segment thus formed on each wheel were found to be in the same fore and aft line.

Particulars.

1st Row of Blades.	Slightly pitted here and there.
2nd Row of Blades.	Slightly pitted here and there.
3rd Row of Blades.	Generally small pitted.
4th Row of Blades.	As above, with a few pitholes penetrating to the other side of the blades.
5th Row of Blades.	-Do- -Do-

NOTE:- Pitholes referred to are small.

Rotor Wheels.

Slight general corrosion especially on 3rd & 4th wheels, the corrosion being more apparent adjacent to the affected blades.

Stator Casing.

Including diaphragms in order.

HP & LP Bearings were found wiped, and were re-metalled. The reactive thrust collar was found wiped, and was also re-metalled. Nozzle locks, interstage diaphragms and Labyrinths interstage packing were removed, cleaned, and replaced in good order. The governor, throttle, and overspeed mechanisms were overhauled and it was found that the overspeed governor was completely inoperative, the valve spindle guide being seized up in the guide bracket. This was freed, and placed in good working order.

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FOUND.

Turbine.

Blades, wheels, etc., heavily coated with a brownish black substance closely resembling black lead to the touch.

Damage. Repairs (No.1) Now carried out.

Generator.

The coils of the Stator were found to have been torn and twisted, the retaining bands of the Rotor were burst, coils displaced and torn, air shields crushed on to the brush rig and collector rings, and the condition of the whole unit was such that necessitated complete reconditioning of the Stator and renewal of the Rotor. This work could not be carried out in this Port, and it was decided to ship the damaged unit to the makers, Messrs. Elliott & Co., in America, for necessary repairs.

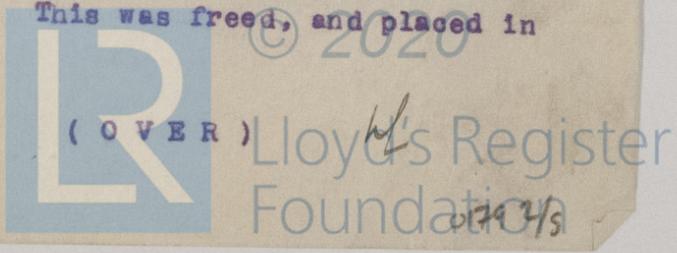
Turbine.

On opening up this unit, it appeared to be very heavily coated with rust, but on closer examination the deposit was

RECOMMENDED.

Rotor to be lifted, and thoroughly cleaned for further examination.

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On completion of the foregoing, the Turbine Rotor Shaft was tested for truth with clock gauge, and it was estimated that the shaft was between .003 to .004 out of truth. It was recommended that the Turbine be boxed up, and steamed at various speeds and stopped for intervals, with the high spot on top, and tested again to endeavour to eliminate this out of truth. Owners however requested that various experiments with the Davley Portable Balance equipment be made. These were carried out, but without result.

The Turbine was eventually reassembled, and steamed up for testing, as previously recommended. The test being witnessed by Mr. Bauer, the Makers, Messrs. Elliott and Co's Representative. Violent vibrations occurred at 2000 R.P.M. Tests were made, and the "high spot" marked. Turbine was topped with "high spot" on top and allowed to remain in that position for one hour and again tested. This experiment was carried out a number of times, but with only improvement, violent vibrations again occurring at 2500 R.P.M. It was then decided to open the Turbine, and straighten the shaft by means of direct heat as previously suggested and now carried out by Mr. Bauer. On examining the blades, after opening up, it was found that the pitting already mentioned on these blades, had now developed into numerous pit-holes penetrating to the other side of the blades. This condition being particularly noticeable in the affected segments previously described, but was also apparent on blades scattered over the wheels. This condition obtained on the first seven rows of wheels. It is considered that the scouring action of the steam effectively removed all dirt and scale contained in the blades, thus turning the condition which had previously been considered pitting into small pitholes. It was decided to carry on with tests, and examine the blades again after sea trials. On completion Turbine was boxed up and tested, and found to run satisfactorily free from vibration at 3,100 R.P.M. Higher

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speeds were obtained, the maximum being 3,700 R.P.M. at which speed there was a slight drumming noise. Between the speeds of 3,100 and 3,700 and at approximately 3,350 there was a period of heavy vibration, and it was considered that the most satisfactory speed for continuous running would be 3,100.

The Main Propulsion Generator was received from America, installed in place, and coupled up to the Turbine. The Stator had been completely overhauled, and the Rotor renewed. The Rotor and Stator bear the following marks :-

Main Generator Rotor.

5400 KW. Prop. Generator Stator.

G.R. 6455.

Serial Nos. 1391 & R 62978/-.

H.T.6- 630.

A. B.

2245

E. S. 137
7/14/45

A 137 B

Date 10/27/48

F. H. 33516.

No. PH 26849

ES 11 - 22. 48.

No. PH. 33446

Main Propulsion Cubicle & Main Switch Board.

All fittings and connections including busbars, terminals, insulators, contactors and circuit breakers, were cleaned, examined and/or placed in satisfactory condition. The indicating instruments were also found or placed in good condition.

After a satisfactory dock trial the vessel was taken out for a sea trial of eight hours duration, and the unit ran satisfactorily at 3,100 R.P.M. The speed was increased to 3,700, but again violent vibrations occurred at 3350, and "drumming" at 3700. After trials the Turbine was opened for further examination of the blading, and no sign of further deterioration was found on the blades. It was decided that the vessel be allowed to proceed to the United Kingdom, via a loading port in the Persian Gulf at a

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turbine speed of 3100 R.P.M. the overspeed trip to be set at 3600 R.P.M. The variable load and speed governor was tested and found satisfactory, and set for a turbine speed of 3100 R.P.M. The overspeed trip was set at 3600 R.P.M. and found to work satisfactorily. Low lubricating oil alarm and trip, and emergency hand trip were also tested and found satisfactory.

Emergency Generator (Damage Repair 2).

This unit was examined consequent on a breakdown stated to have been caused by the failure of No. 3 crank bearing bolts. Minutes after the spare brasses had been fitted to this crank. The following defects were found, and the following repairs carried out.

All damage occurred in No. 3 Engine. The crank bearing was fractured across the crown, the connecting rod bent, and the palm of same also bent, one bolthole in the palm strained and elongated, and one fractured. The palm of the connecting rod found lodged on top of the camshaft, which had been bent in a sharp vee between the bearings at this point. No. 3 Cylinder which is incorporated with the water jacket had the skirt bent away on each side.

The Engine was completely stripped, crankshaft examined and tested for truth, and found in order. No. 3 Cylinder liner renewed. A new connecting rod complete with gudgeon pin bush, crankpin bearing and white metal shells was fitted. The camshaft and one inlet and one exhaust rocker arm, and one exhaust pump were also renewed, fan driving belts renewed. The machine was completely reassembled, tested, and found in satisfactory condition.

Annual Survey of Main Boilers.

Two (2) Main Water Tube Boilers were opened on the fire water sides, and thoroughly cleaned, including superheater

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water tubes. Boilers were examined internally and externally, and found in good condition. Brickwork found in good condition. All valves and mountings on both boilers including the safety valves were opened for examination, and after being cleaned and ground in, were found in satisfactory condition. Valves were repacked, rejointed, and boxed up in good order. The water sides of both boilers were boxed up in good clean condition, filled and subjected to a hydrostatic test of 650 lbs., being $1\frac{1}{4}$ times the allowable working pressure, and examined under test, and found satisfactory. The fire sides of both boilers were closed up in good order, and steam raised. Safety valves were set to lift at the allowable working pressure as follows :-
Steam drums 500 lbs. Super heaters 470 lbs.

Propeller and Dock.

The solid bronze propeller was examined, and found in satisfactory condition.

The tail shaft wear down showed $5/32$ " in way of the after bearing.

The tail shaft was drawn, key removed, and tail shaft and continuous bronze liner examined and found in good condition. Signs of slight corrosion were apparent on the liner between the inner and outer bearings, as well as slight wear in way of the stern gland packing.

The Stern Tube was not re-wooded.

The tail shaft was replaced, and propeller refitted in good order. A rubber ring was fitted as a water seal, and the stern gland was repacked.

All sea injection valves, including pumproom, and emergency bilge injections, together with all overboard discharge valves, were opened up for examination, and after being cleaned, and valves ground

and found in satisfactory condition, with exception of the Main Circulating Low Suction Valve chest, which showed very heavy corrosion and pitting in the forward branch piece. Wastage is maximum on the bottom where it is $13/16$ " deep, leaving $7/16$ " at this point. It was

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recommended that a mild steel strap be fitted round the branch piece on the outside, and that the valve chest be renewed at the first opportunity.

All sea chest strainer plates were removed, sea chests examined, found in satisfactory condition, painted internally, strainer plates replaced in good order.

A spare propeller and tail shaft were placed on board, and the following identification marks :-

Spare Propeller.		Spare Tail Shaft.
Baldwin.	Phila.	L - 2 W 6156 - 1520.
Heat.	904.C.	32.
Weight.	36700 lbs.	1/ 2/ 48.
A.	268. B.	Ser 1520.
J. O. M.		S
6/11/48.		A. 204. B.
T. 2. Tanker.		W. D. V.
Cramp.		8/6/48.
		T 2 - se - Al.

Special Survey No. 1.

The following items were examined in connection with this

Item.	Recommended.
Main Circulating Pump.	Machine & sleeve impeller way of lower bearing. Re bearings. Carried out.
Main Condensate Pump (Outboard)	Impeller worn in way of spare impeller and shaft fitted. Old Impeller shaft reconditioned by fitting in way of bearings. Car
Main Condensate Pump (Inboard).	In order.
Auxiliary Condensate Pump.	In order.
Ford. Oil Fuel Service Pump.	In order.
After Oil Fuel Service Pump.	In order.
Forwd. Oil Fuel Transfer Pump.	In order.

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Item.	Recommended.
After Oil Fuel Transfer Pump.	In order.
Forwd. Fire & Butterworth Pump.	Impellor shaft bent, spare to be fitted. Carried out.
After Fire & Butterworth Pump.	In order.
For'd Sanitary Pump.	In order.
After Sanitary Pump.	New Impellor, casing rings, and shaft sleeves to fit. Carried out.
For'd Bilge Pump.	Reconditioned, water end fitted here. In order.
After Bilge Pump.	Casing liner and blades to be renewed, shaft to be built up and machined in the way of packing. Carried out.
Port Main Cargo Pump.	Shaft sleeves to be renewed in way of packing, ball bearings at for'd end to be renewed. Carried out. In order.
Starboard Main Cargo Pump.	In order.
Port Cargo Stripping Pump.	In order.
For'd Main Feed Pump.	In order.
After Main Feed Pump.	Spare Impellor shaft together with bearing and thrust pads to be fitted. Carried out.
Sub. Oil Service Pump (Rotary).	In order.
No. 1 Aux. Generator Turbine.	Alignment checked and found correct. Bearings and thrust in good order. Clearances correct. Gearing slightly noisy. In order.

Main Condenser.	main air coolers	In order.
Aux. Condenser.	transformer	In order.

It is recommended that the overhauls and repairs carried out on the Emergency Generator and the Main Propulsion Generator and turbine should be counted towards Special Survey No. 1 subject to the Steam Turbine Rotor being specially examined on the vessel's arrival in a United Kingdom Port, or before the 31st May, 1949, and

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that the notations T S D and MBIR. S. 2/49 be made in the Register Book in the case of this vessel.

W. R. Whitt

ENGINEER SURVEYOR TO THE
BRITISH CORPORATION REGISTER
OF SHIPPING AND AIRCRAFT
BOMBAY.

1st Visit. 14-4-48.

Last Visit. 23-2-49.

In all : 23 Visits.

Fees : No. 1 Damage Repairs.	Rs.600/--
Sunday fees. No.2 Damage Repairs.	" 150/--
Fee: Special Survey, Boiler etc.	" 550/--
Travelling Expenses.	" 90/--

Rs.1390/--



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