

Lloyd's Register of Shipping,

95, Bothwell Street, Glasgow, C.2.

7th June, 1937

Dear Sir,

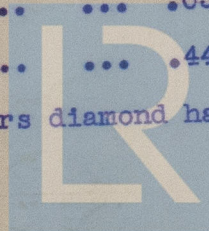
With reference to the Secretary's (London) letter dated the 29th May respecting the S.S. "MANIPUR", I have examined the broken rivet heads forwarded from Liverpool and can find no evidence that fracture of the rivets has been due to chemical embrittlement.

In three of the rivets sectioning along different planes failed to disclose any subsidiary cracks branching from the main fracture and there was evidence that the material immediately adjoining the fracture had been distorted by cold work.

Analysis of the material in one rivet was as follows:-

Carbon14 %
Silicon...053 %
Sulphur...049 %
Phosphorus035 %
Manganese.44 %

The average Vickers diamond hardness of this material/



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material was 152, equivalent approximately to a tensile strength of 32-34 tons per square inch. In conjunction with the chemical analysis this indicates considerable compression of the material when it was worked.

The sulphur prints of three defective rivets in Fig. I show that there is no marked central segregation.

Typical micrographs of cracks subsidiary to the main fractures are shown in Fig. 2. Fig. 2(a) at a magnification of 100 diams. shows that the path of a crack is nearly straight and while the fineness of the grain makes it difficult to ascertain whether the crack is trans - or inter- crystalline, this straightness is more indicative of "fatigue" than of chemical embrittlement. Fig. 2(b) at a magnification of 300 diams. confirms the transcrystalline nature of a fine crack, particularly at the points marked by the arrows.

I am, Dear Sir,

Yours faithfully,

William Lewis

The Secretary,

GLASGOW.



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