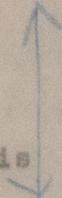


auxiliary feed, no feed water is pumped directly into the outboard sections. Mr Ballam advised that all the tubes which failed were in the after end of the tube sections, that is, nearest the combustion chamber, and that they were all 11-gauge tubes. He advised that the failures were about 13 inches from the tube sheet of the Mud Drums and that they were fine holes as evidenced by his being able to put a wire into them.

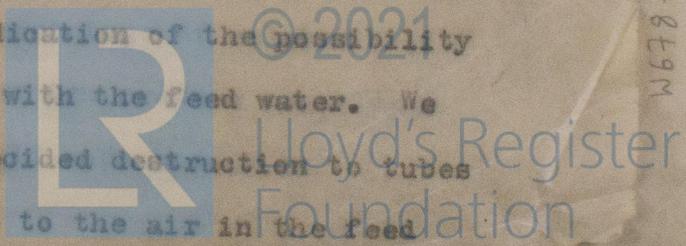


We investigated today the possibilities of getting a wire into a tube in the centre of the tube section and found it would be rather a difficult thing to do unless the hole was quite large. The location of the holes in the tubes was determined by filling with water and noting where the water spouted out on the tubes.

Mr. Ballam further stated, that to his knowledge, one of the boilers had been without water showing in the glass for as much as 30 minutes. He also stated that this was occasioned by the pump becoming air-bound, and that the feed pump had on numerous occasions become air-bound. These meagre statements have direct bearing on the following:-

(1). Internal Pitting. Internal pitting could be caused by aerated feed, the air being trapped in the water, carried down through the down-comer tubes and acting on the tubes where the tubes were in the hot gases. Such pitting frequently acts very quickly and affects the tubes where they have been rolled into the tube sheets and where the ends have been heated for annealing. The fact that the feed pumps have become air-bound is an indication of the possibility of getting air into the boiler with the feed water. We know of frequent cases where decided destruction to tubes by pitting has taken place, due to the air in the feed

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ater, and certain changes in internal feed pipe arrangements in boilers have been made in order to reduce the pitting action on this account. We notice that the boilers are not fitted with zinc plates, usually provided to prevent pitting.

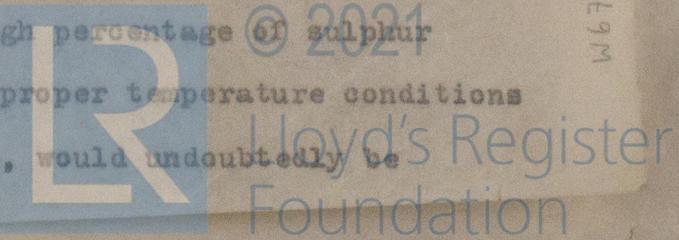
In the inspection made today on the port boiler of the "WAR COMOX" we found evidence of slight pitting in a number of tubes in the starboard section of this boiler. This pitting could not be considered serious except in so far as it might present evidence of what would take place to a greater degree on service at sea.

Mr. Campbell pointed out a number of tubes that were grooved in manufacture, but the writer does not consider these, of themselves, sufficiently defective to cause the difficulties experienced.

2). External Corrosion. We removed the side casing of the starboard side of port boiler and brushed off the soot which had accumulated on the tubes, as the soot was from 1/16" to 3/16" in thickness and coated with a white ash, evidently representing the fine material carried up in the flue gases just prior to drawing fires. The amount of accumulation showed plainly the necessity of some means of periodically removing the ash dust and soot from the tubes. The soot and dust builds up on the tube sheet on the mud drum and it is difficult to remove same with the present facilities provided.

There was no visible evidence of external corrosion on the boiler inspected. However, if leakage occurred in the lower end of boiler tubes and the soot and ash becomes moist from such leakage, the high percentage of sulphur in the coal, combined with the proper temperature conditions or rapid action of any ^{acid} present, would undoubtedly be

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conducive to more or less rapid external corrosion.

The evidence presented in the examination of the "WAR COMOX" boiler, however, would not lead one to conclude that the difficulties experienced in the other boats had been due to external corrosion.

(3). Splitting of the tube or blistering due to over-heating

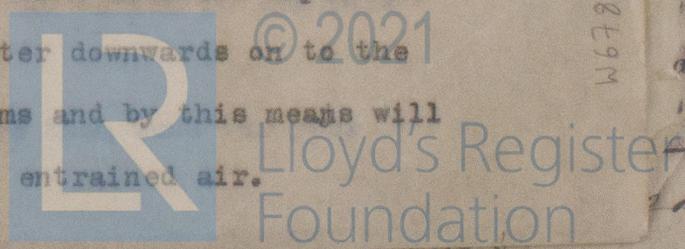
If the boilers that have given trouble were provided with seamless tubes, it is difficult to conceive of tubes being ruptured by splitting in the quantities reported, namely, 25 tubes per boiler on the "SONGHIEE" and 24 tubes on the "NOOTKA". These tubes might have however, been over-heated and blistered as the result of low water, although it is highly probable that such defects would have occurred in the top portion of tubes rather than 13 inches from the mud drum, as reported.

In conclusion, in the light of the information at hand and in view of your desire to try and forestall repetition of the present troubles in the ships about to put to sea, I would recommend the following:-

- (1). That zinc plates be installed in the boilers so as to minimize the possibility of pitting.
- (2). Boilers be fed milk of lime with feed water, sufficient to form a slight internal protecting coat.
- (3). The internal feed pipes be re-arranged so that:-
 - (a). Feed water will be distributed to all three sections.
 - (b). Feed water will be liberated above the water line in steam drums, through nozzles (to permit of equal distribution to the three drums) fitted with umbrella caps. The umbrella caps will spray the water downwards on to the surface of the water in the drums and by this means will liberate a large portion of the entrained air.

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 Total No. of visits } 28

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inspection, sections of the tubes which failed, showing the failure. Such tubes could then be sawed through at the point of failure to show the cause of same.

It would also be well to ascertain as to whether the tubes were at all scaled on the inside, and as to the accumulation of soot and ash on the tube sheets of the Mud Drum.

The above report is intended to briefly outline the conclusions reached by the writer, after obtaining all information possible from the parties named in the first part of this report. Further information from the ships now at sea will undoubtedly definitely locate cause of trouble.

The writer would recommend however, the changes mentioned above as being desirable in prolonging the life of the tubes in the boiler, irrespective of other changes or not.

Further information should determine that the trouble now experienced is not due to either internal pitting or external corrosion.

Respectfully submitted.

"H. W. Beecher".



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