

23.14.2 report on investigation of boiler troubles

Imperial Munitions Board Fleet.

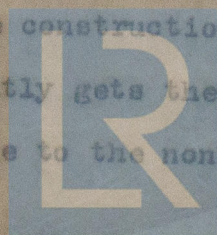
September 27th, 1918.

The writer spent yesterday afternoon interviewing
Mr. Alexander Campbell, Craig and Ballam, in an endeavour
to become familiar with all the available information regard-
ing difficulties so far experienced with the Howden Boilers.
This morning made an examination, in conjunction with
Mr. Campbell and Craig, of the Port Boiler on the "WAR

The writer has not attempted to analyze the situation
from the standpoint of criticism of the design of the boiler.
He merely attempts herein to outline the possible causes of
trouble and give recommendations as to remedies for same.

On account of having no definite knowledge as to whether
the tubes on the "WAR NOOTKA" and "WAR SONGHEW" failed as
a result of internal pitting, external corrosion, splitting
of the tube or blistering due to overheating, it is necessary
to consider any or all of the above as possibilities. These
will be taken up in order later.

Mr. Ballam, who has returned from Salina Cruz, reports
that 24 tubes on the "WAR NOOTKA" had failed and been plugged
at the time he left the ship. These were about evenly
divided between the starboard and port boilers, but all of
the tubes that failed were those in the inboard section, in
other words, the starboard section of the port boiler and the
inboard section of the starboard boiler. The main feed connec-
tion is made directly into this section, with a branch pipe
to the middle section, but the construction of the boiler
is such that this section evidently gets the major portion
of the boiler feed water; and due to the non-use of the



© 2021

Lloyd's Register
Foundation

2.5800-849M

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.

W678-0085 1/2

W678-0085 1/2

ter, 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.

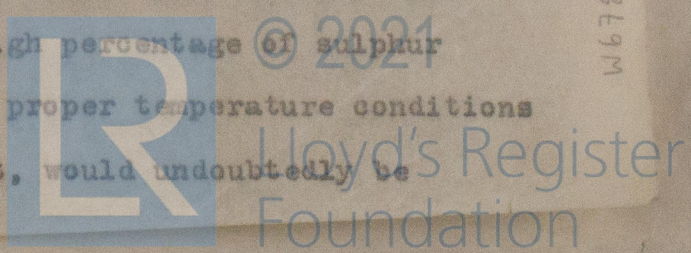
In the inspection made today on the port boiler of the "WAR COMOX" we found evidence of slight pitting in a number of tubes in the starboard section of this boiler. This pitting could not be considered serious except in so far as it might present evidence of what would take place to a greater degree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

2/5800-879M



July 29. Aug. 5-16. Sept. 7. 13. 20. Nov. 4. 11. 18. 26. 28. 30. 1.
Total No. of visits

Is the approved plan of main

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 "SONGHEE" 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.

© 2021
Lloyd's Register
Foundation

Is the approved plan of main bo

370

1. ft.
ry an
don.
lded
"
5th W
7.
escri
h. 1880.

iles
 : Sic
 of s
 lateri
 Diam

ays
el
Sta

the s
udi
tes
13/
th

el
yfe
ackn
ed

kn

29. Mar. 6. Apr. 9. May 1. 1. 14. 20. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 85

To the approved plan of main boiler for