

LNG tanker Wartsila Engine repair

Repair completed by *LOCK-N-STITCH* Inc.

July 2012



A1A Cam box damage

Damaged cam box area on A side



Series of drilled holes to help with removal of the damaged area



Damaged area removed using a handheld grinder



First set of stitching pins installed



Second set of stitching pins installed



Locks installed completely around entire patch to add additional strength



Completed repair on A1A Cam box



Damaged B1 Cam box



Damaged area cut out and ready to accept patch



Large patch fit into place



And a second patch was fitted at a different angle





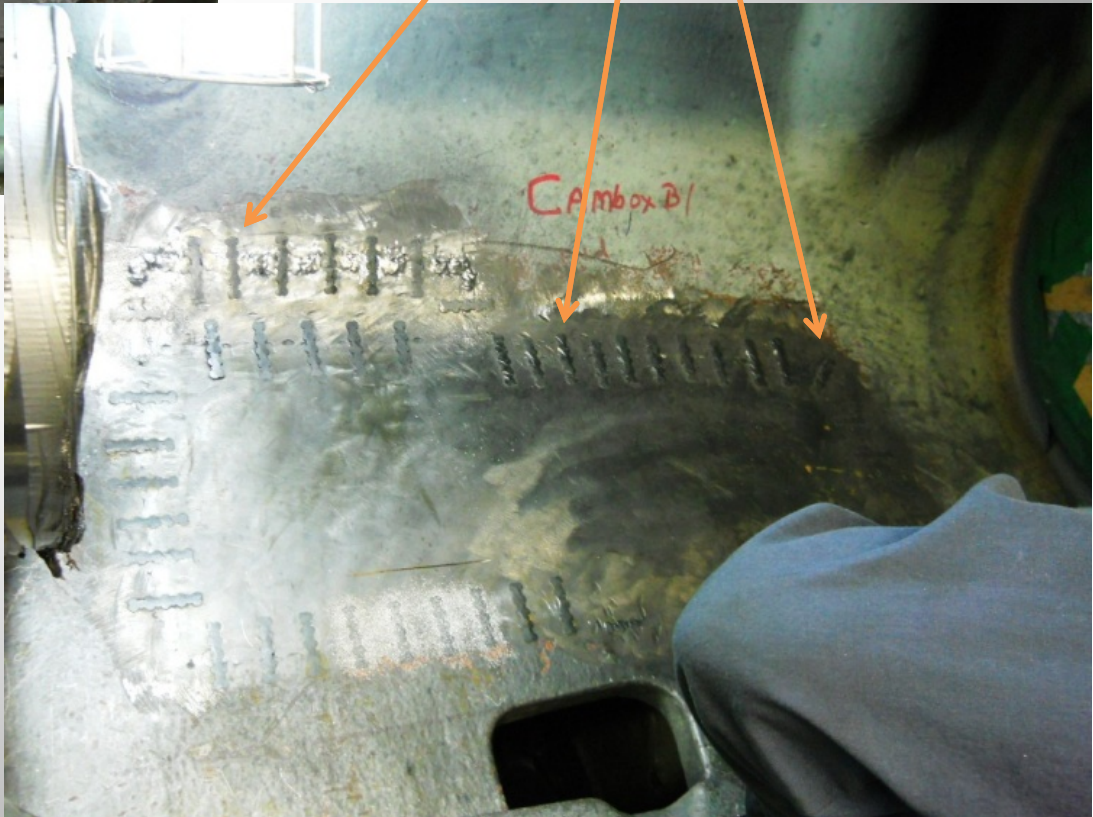
Stitching is almost completed and Locks are ready to be installed





Second patch being stitched

Locks installed around entire patch to add additional strength



Cam box B1 repair completed



Damaged B1 Inspection door





Cutting out damaged area to accept new casting around inspection door B side.

Area cut out to accept new casting.



New casting for inspection door being manufactured



New casting being fitted and ready to start metal stitching



Inspection door metal stitched and ready to have gasket surface machined



Inspection door metal stitching completed



Back side of inspection door opening with locks installed to add additional strength along the repair and the milling machine is being mounted



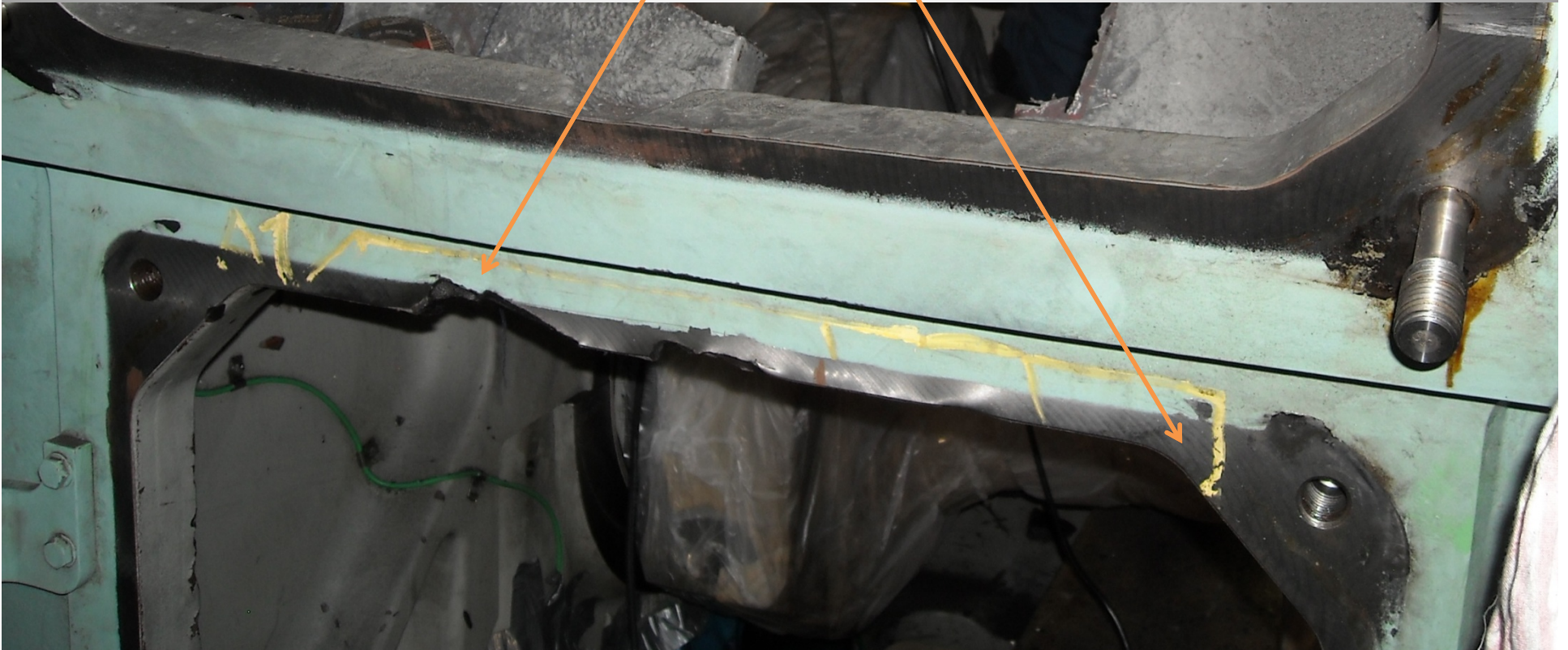
Inspection door gasket surface being machined with our 7' bed mill



Inspection door metal stitching repair completed and the gasket surface has been machined.



Damaged A side inspection door



Removing damaged area by grinding out area to accept new casting



Damaged area removed and ready to accept new casting



Metal stitching using our Castmaster stitching pins



Gasket surface on inspection door repair completed ready to be machined



Inspection door A side gasket surface repaired and machined



Damaged area on the inside of the water channel



Removing damaged area by drilling holes from the bottom of the water channel



Water channel damaged removed and ready to accept new casting



Making the template for the water channel casting



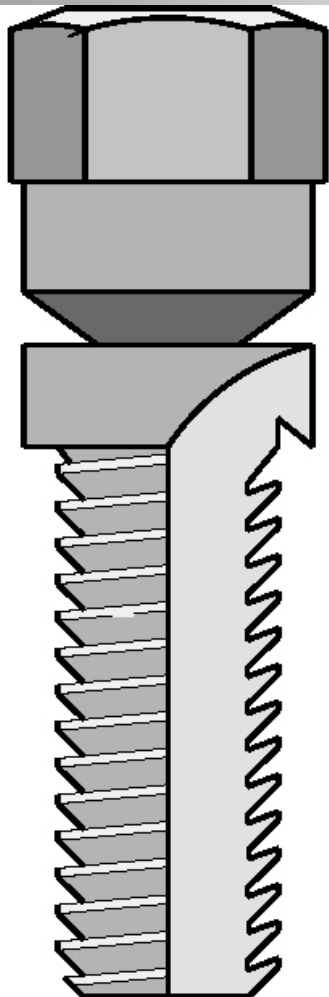
New casting metal stitched and ready to be hand finished



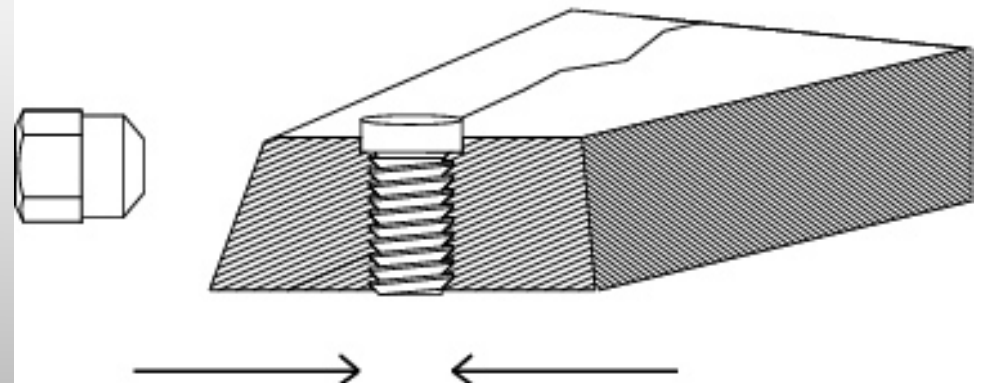
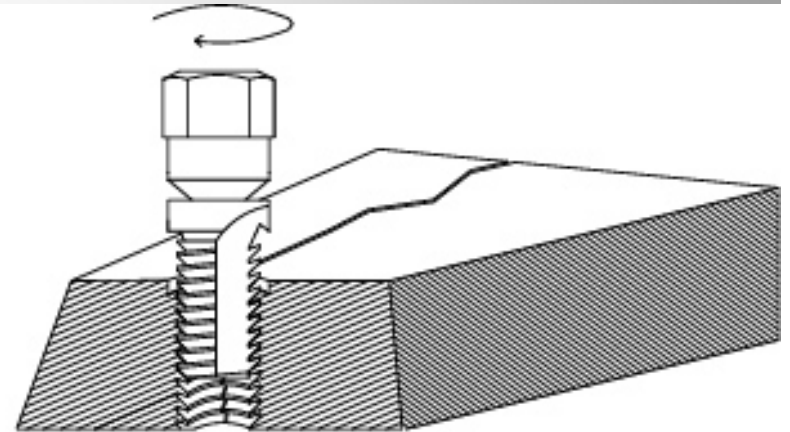
Water channel repair completed



CASTMASTER® Stitching Pins



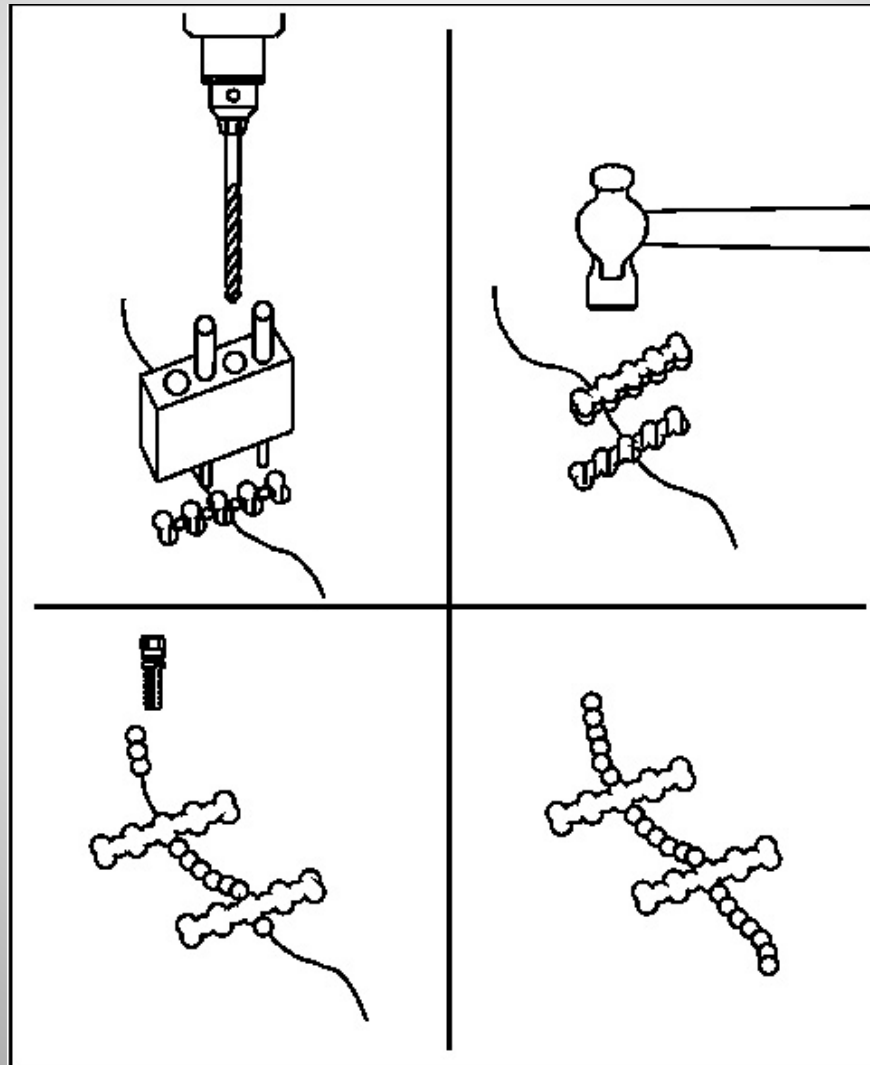
CASTMASTER stitching pins have the unique ability to draw the sides of a crack together when tightened into the drilled, Spotfaced and tapped hole.



Specifications:

Tensile strength: L20B = 6650 PSI each; L20S = 13,125 PSI each

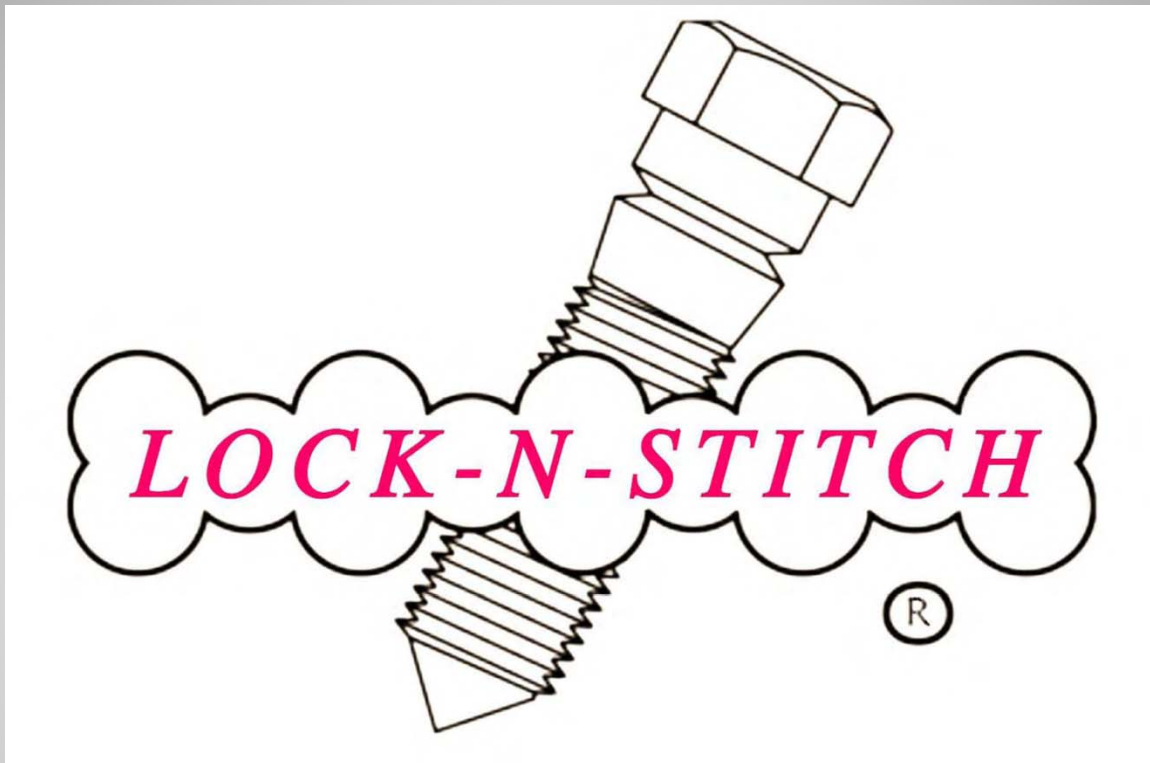
Material: heat-treated 4130 steel



Final repair inspection process

Final repair inspection process

1. LNS technicians performed in-process and final inspections of each repair site once the metal stitching process for that area was concluded.
2. The process involved using a magnetic particle inspection process with either dry powder or wet particle methods.
3. The metal stitching locks and stitching pins have magnetic properties that are slightly different from the cast iron so the outline of the repairs attracts the magnetic powder when a special magnet is placed on the part with the North and south poles spanning the repair.
4. This method quickly and easily shows any gaps between the pins or any crack that may have been missed.
5. If a gap is detected on either side of the repaired wall, additional stitching pins could have been added to the repair.
6. The final inspection showed no spaces, gaps or cracks at or around the metal stitching repairs that were repaired.



This repair required eight (8) weeks to complete.

Completed repair by
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