THE REPAIR OF WORN PROPELLER SHAFT LINERS IN PLACE

BY

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H.M.S. *Glory* arrived at Rosyth Dockyard during the autumn of 1953 suffering from serious leakage from both stern glands—a defect which had to be made good in a docking period of eight weeks. Examination revealed that the stern gland packing had worn grooves a little over $\frac{1}{8}$ in deep in the 1 in thick, $18\frac{1}{2}$-in diameter, gunmetal shaft liners. Repairs by fitting extension pieces to bring the stuffing boxes to an unworn portion of the shaft had already been carried out at a previous refit, which meant that either the liners had to be renewed or the grooves removed from the existing ones.

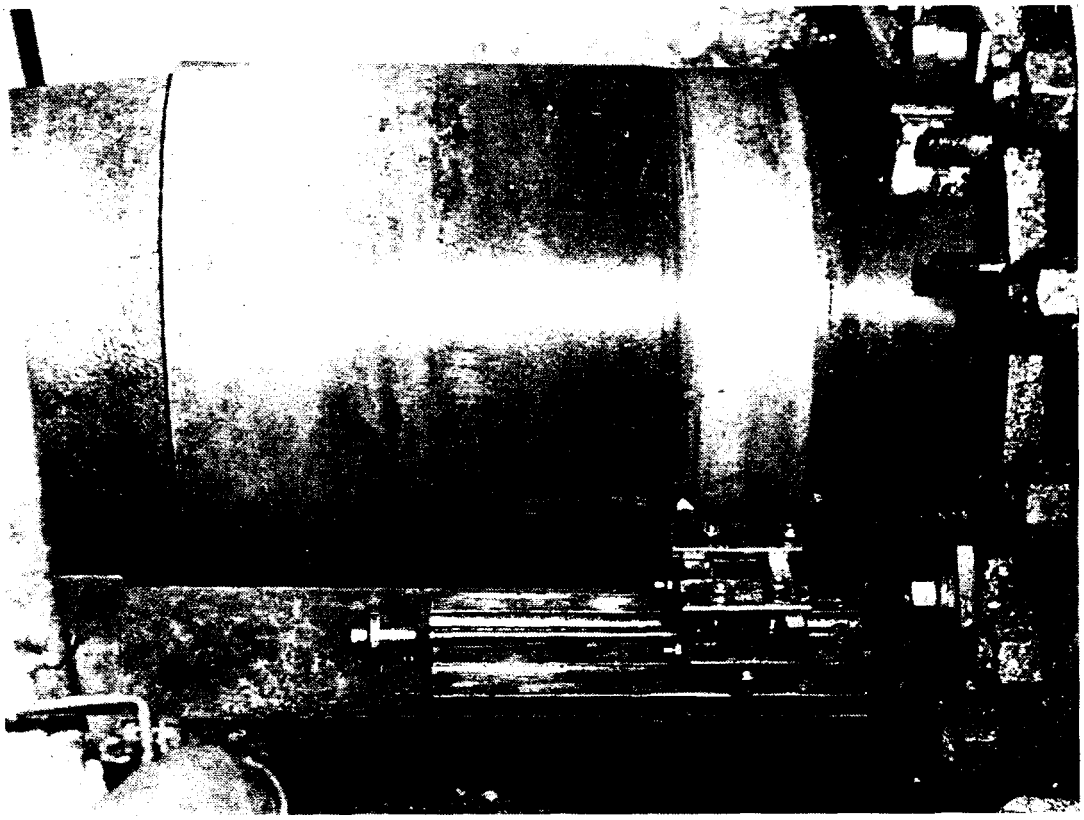
Spare shafts were not available and the only lathe at Rosyth capable of dealing with this work was undergoing extensive repairs, so that a decision was made to machine the liners in place.

A slide rest was mounted on a 3-in steel channel bar temporarily secured to the ship's structure, and a ' steady ' consisting of a block of lignum-vitae shaped to the circumference of the liner was pressed against the shaft by bolts through a steel angle bar secured to the stuffing box studs, as is shown in the photograph of a similar arrangement in H.M.S. *Perseus*.

Providing the means of rotating the shaft at a reasonable speed was not quite so simple. Reference to the previous docking forms D.488 showed that the turning motor took about five minutes to turn the shaft through one revolution, so that some means of speeding things up had to be devised if the ship was to sail on time. Various ways were considered, including the rigging of a motor in the dock with a belt drive on to the propeller cone (some bright spark even suggested using the local fire brigade to squirt water at the propeller). Finally the H.P. and L.P. turbine rotors were de-clutched and the shaft was rotated by the electric turning gear through the main gearing. The speed of the shaft was increased to nearly 1 r.p.m. by fitting a smaller sprocket to the worm shaft of the turning gear and consequently shortening the driving chain ; the final adjustment being made by lateral movement of the electric motor.

Lubrication of the main gearing was provided by the motor-driven forced lubricating pump, the motor being satisfactorily cooled by circulating L.P. air through the cooling coils as circulating water was not available. The drip feed oil supply to the worm drive of the turning gear was inadequate, an additional supply was taken from a pressure gauge connection on the main gear case, and the worm kept completely immersed in oil by restricting the leak-off from the drive casing.

A preliminary run showed that the current required by the turning motor was 12 amps which was well within its capacity. In order to control the operation a temporary telephone was installed to provide communication between the turner in the gland space and the prime mover in the engine room some 265 feet away.



ARRANGEMENT FOR MACHINING SHAFT LINER IN GLAND SPACE

All was now ready to take the first cut, but results were far from promising, as the propeller went round in a series of jerks, giving a surface, to quote the words of the ship's Engineer Officer, ' like the skin of an orange '. The cause was obviously friction between the shaft and the lignum-vitae strips in the stern tube bush. Lubrication by water gave no improvement, but a drip feed lubricating oil supply fed between the top lignum-vitae strips gave satisfactory results and incidentally reduced the current required by the driving motor to only 4 amps. A joint was fitted to prevent excessive inboard leakage, and the drain-off outboard was collected in drums and used again.

Now that a smooth turning motion had been obtained, machining was resumed and in ten working days the required true surface nearly 18 inches long was produced. New stuffing boxes were manufactured to suit the new liner diameters and fitted in their original positions, the existing extension pieces being retained on board for future service if required. ' Sterntite ' packing was used and ship's officers have reported that the stern glands run cool with negligible leakage.

While in this instance a good deal of time was spent in deciding on the method to be employed and in arranging the details of the rig required ; in the light of experience gained it is estimated that future machining in place would take half the time and result in rather less than half the cost of withdrawing the tail shafts and machining them in the shop.