

A METHOD OF REPAIRING A BROKEN CRANK SHAFT.

H.M.S. "Amphitrite," after being fitted for special service, developed defects on Service, and on examination it was found that the main journal of the Port IP crank shaft was fractured, extending up the crank web as indicated in Fig. 1.

The engine was of the three-stage four-cylinder type with HP engine forward and IP aft, working on the forward length of crank shaft with cranks opposite and two LP engines working on the after length of crank shafting with cranks opposite and at right angles to the HP and MP cranks. The crankshaft was solid forged in two lengths, with a coupling between the IP and forward LP cylinders, and an undrilled coupling at the forward end of the forward length.

Three methods of making good the defect were considered :—

(a) Fitting a new crank shaft. Under the then existing conditions the time required for the manufacture of a new shaft was prohibitive, and although a replace shaft of approximately the same dimensions might have been obtained from a similar vessel on a foreign station, it was at the time difficult to provide freight for quick delivery or had this been possible to ensure with absolute certainty delivery in England. Also this replace shaft was fitted with bolts to a slightly different pitch circle, which fact had to be born in mind when carrying out repairs.

(b) To turn the remains of the broken shaft end for end, fit a distance piece between the two lengths of crank shafting to bring the crank in the correct position axially, cut out the HP engine entirely, and work the engine as a three-cylinder two-stage engine instead of a four-cylinder three-stage engine. This would have given a very uneven turning moment and have produced an engine which would have been difficult to manœuvre. Further in case of emergency, it was very desirable for the intended service that the full power of the engines should be available.

Under these circumstances, it was decided to follow a third course, which consisted of turning the forward length of crank shaft end for end and fitting a new forward end, this being keyed to the remaining portion of the broken crank web and secured in position by a solid strap shrunk on.

Owing to the character of the crank web it was not possible to obtain sufficient surface to shrink a web on the crank pin.

The method of repair is illustrated in Fig. 2 and Fig. 3 shows the distance piece fitted between the two crank shafts, this being designed so that the shaft from the similar vessel referred to could be quickly fitted if and when obtained.

On completion of the work the engine developed full power and worked satisfactorily until her services were no longer required on the signing of the armistice.

In regard to this and repairs of a similar nature it may be of interest to state that a similar method of repair has been adopted in other cases of broken crank webs in solid forged shafts of smaller sizes. In one case one of the intermediate crank webs of a four-throw crankshaft for a steamboat was similarly repaired. It was necessary in this repair to heat the band and reeve it hot over the crank before assembling the two parts and placing the band in position. In this case theoretically the shrunk-on band takes all the working strain, but the repair has proved effective in several cases where the crank pit clearance has been sufficient to allow it to be fitted.

