NOTES ON MACHINERY DEFECTS AND PRACTICE.

Overheated Boiler Tubes.

Whilst on passage using two out of three boilers it was found necessary, in order to keep station, for a T.B.D. to develop full power in these boilers from time to time. During one of these periods the oil fuel pump lost its suction, and a few minutes elapsed before the suction could be regained by opening out on the peace tanks. On arrival in harbour, examination showed that the fire row tubes of these boilers were badly sagged and distorted, and a subsequent water-pressure test showed that the steam drum ends of the tubes were leaky.

It was supposed at first that the defects were due to sudden reduction of temperature following the continued admission of cold air to the furnace when the fuel supply ceased, but this view could not be supported. After full consideration of the facts it was considered that the over-heating was a result of the boilers being worked up to full power again too quickly after the temporary failure of the fuel supply. Under ordinary conditions a limit is necessarily imposed to the time required to work the boilers up to full power by the conditions obtaining in the furnace and elsewhere, and the circulation of water in the boiler gradually accelerates to correspond with the increasing furnace temperature. Here, at the moment of restarting the fires, the furnace and other conditions were almost ready for full power, but the circulation of water had subsided, and as a result of this, coupled with priming probably, a very low water level would exist in the boiler. Until the circulation was restarted, a matter of a few minutes only, perhaps, the upper parts of the tubes were exposed to a high furnace temperature on the one side without a supply of water on the other side to carry away the heat, and consequently became overheated.

This mishap points to the necessity of appreciating the comparatively small amount of water contained in a water-tube boiler when being forced and the necessity of safeguarding the water level and allowing a reasonable time for working up to full power under conditions parallel to those mentioned.

Defect in Michell Thrust Block Segment.

An investigation of the failure of a segment from a Michell thrust block of a 5,000 k.w. generating set yielded a somewhat curious explanation which proves of interest, if only in emphasising the principle of action of this class of bearing. The sketch shows the contour of the white metal surface as received, the figures thereon indicating in thousandths of an inch, the height of the surface above or below what appeared the original surface. It will be seen that a considerable proportion of the bearing surface is below the datum level and the appearance of the surface indicated that this portion had not been under load. Portions of the white metal surface in the wake of the ribs were carefully removed and revealed the facts that there was a considerable amount of oil behind the white metal in these positions, and that the metal was only about $\frac{1}{8}$ in. in thickness and had not adhered properly to the gun metal. Further, that the white metal had not penetrated into the peg holes provided for anchoring the metal. Exploration of the white metal from the thicker portions of the white metal away from the ribs also showed that the metal had not adhered and oil was also found.

A blow hole in the white metal was also found in the position marked B.

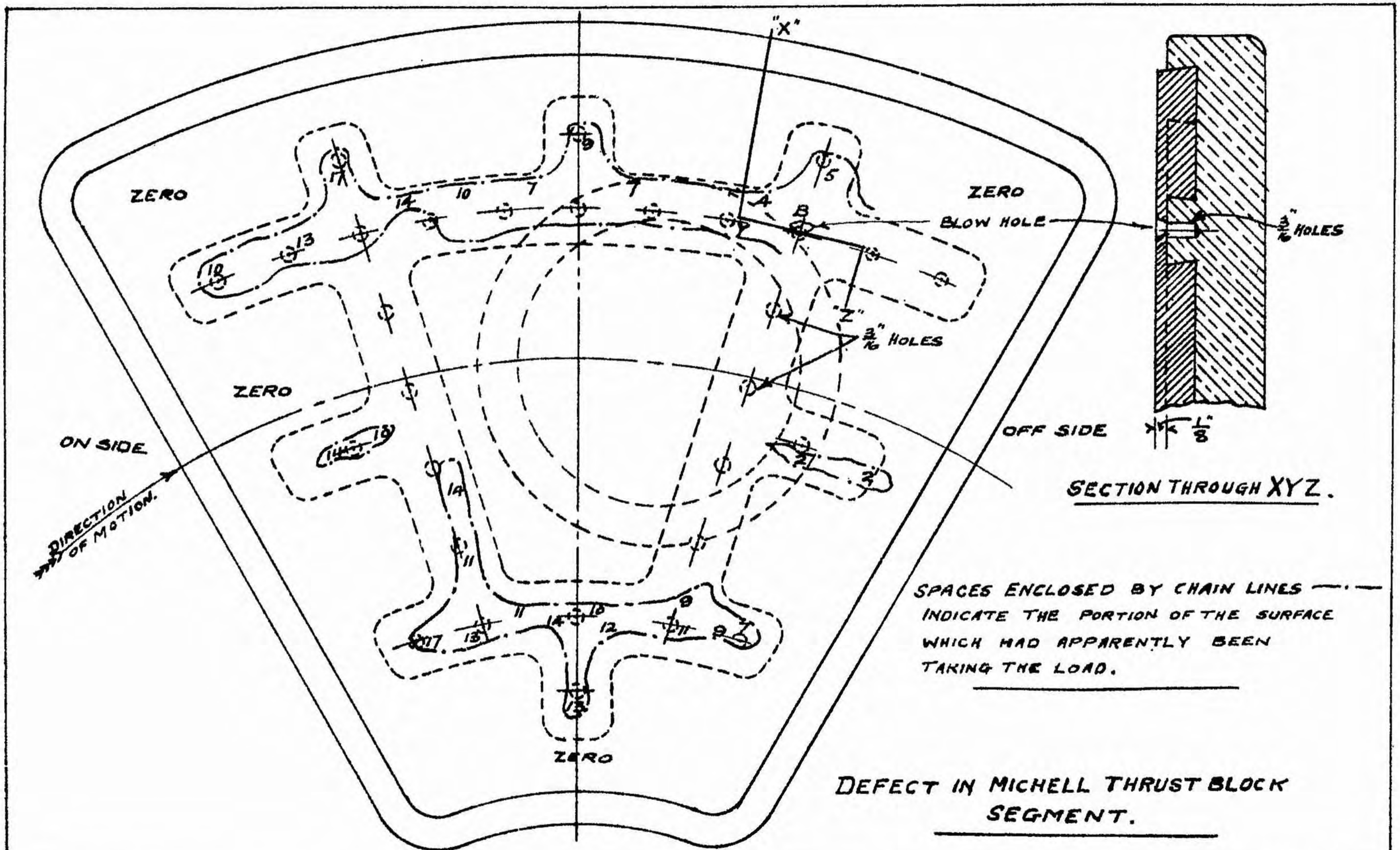
The explanation of the defect was that the oil under pressure generated between the thrust collar and this pad entered the blow hole at this region of relatively high pressure, found its way between the white metal and gun metal and, acting on the thin portions of the white metal, forced these portions into relief. This view is supported by the fact that the elevation of the metal is greater towards the "on" side of the pad which is to be expected, seeing that the oil film pressure is less towards the "on" side, whereas the internal oil pressure leaking by way of the blow hole between white metal and gun metal would be equal to the higher oil film pressure generated in the region of the blow hole.

This defect indicates the importance of taking the utmost precautions to ensure effective adhesion between the white metal and the gun metal by careful tinning and preheating of the brass to avoid sudden chilling of the white metal when running. It indicates also that the thickness of metal allowed over the supporting ribs is insufficient and that the method of anchoring by peg holes of this size is not likely to prove an effective one.

Engine Bearing Defects Developed when Towing.

The investigation of a case of defective engine bearing which developed on Service, revealed the fact that the effect of towing another vessel on the engine power developed at any particular speed of revolution, had not been taken into account when working up, with the result that damage occurred necessitating the renewal of a number of crank and crosshead bearings.

In the particular case referred to, a minesweeper, the engines were of the reciprocating type designed to run at 270 revolutions per minute at full power. The boilers were designed on a liberal basis and were capable, under Service conditions, of producing a greater quantity of steam than was actually needed at full power, in view of the fact that the vessel might be manned with mercantile ratings.



SPACES ENCLOSED BY CHAIN LINES —·— INDICATE THE PORTION OF THE SURFACE WHICH HAD APPARENTLY BEEN TAKING THE LOAD.

DEFECT IN MICHELL THRUST BLOCK SEGMENT.

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In the execution of her duty, the vessel took another in tow, and the defects became evident when a speed of revolution of 250 per minute had been attained. The evidence showed that the ship's staff had not appreciated that under these towing conditions the full designed pressures on the engine bearings were being realised and possibly somewhat exceeded. No steps had been taken to increase to an adequate extent the oil supply or to apply any cooling water, with the result stated.

In this connection it may be observed that the resistance offered to turning by a particular propeller depends upon the conditions outside the vessel. When a vessel is running free, the resistance to turning and the revolutions increase together. When towing or exposed to similar conditions, *i.e.*, an increased resistance to the passage of the vessel, the increased thrust gives rise to an increased turning moment over that which would otherwise obtain at any particular speed of revolution. Thus, in the example referred to, the full turning moment and consequently the maximum effective pressures in the cylinders and the load on the engine bearings was realised at a lower speed of revolutions than when the vessel was running free.