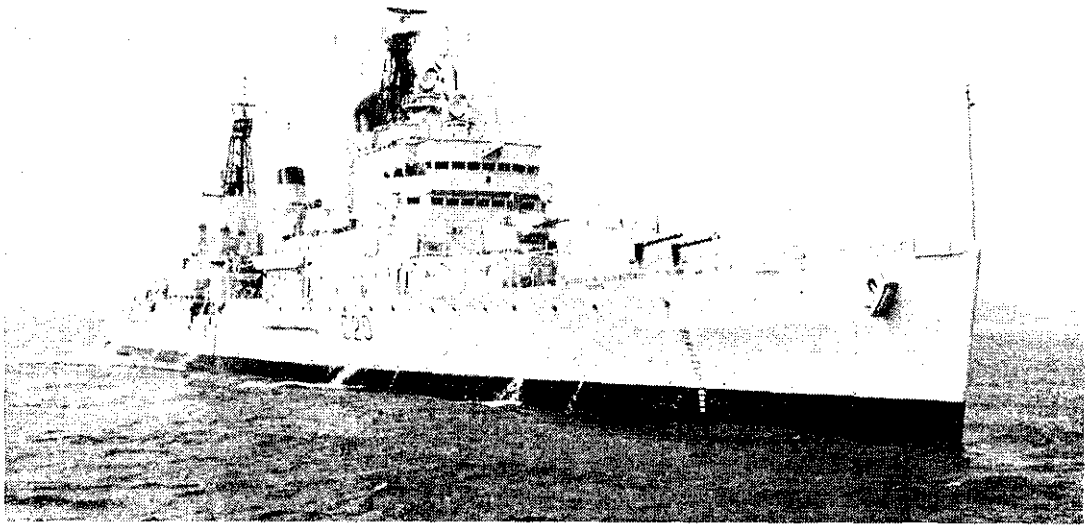

H.M.S. 'TIGER'

PART II

NOTES FROM SEA

Readers are invited to discuss either the extracts or the comments in the correspondence sections of the Journal.

MARINE ENGINEERING

Comments by D.M.E.

Boats—Second Training Sqaudron

The Enfield H.O.2 engine in the seaboat is not quite easy enough to start, in spite of the start pilot ether equipment. (A.F.O. 2686/58) A large E.R.A. starts it easily enough, but a small M.(E) is too apt to fail. This otherwise excellent engine, therefore, has not the confidence of seamen officers.

The stern gear in this whaler remains basically quite unsuitable. The reversible-pitch propeller arrangements require too much maintenance. The air-cooled engine must be started once a watch at sea to keep it warm, but cannot be run at the davits for more than two or three minutes for fear of overheating the stern tube. A solid propeller and a small clutch and reverse gearbox would do much better in these boats.

Comment

With regard to the startability of the H.O.2 engine, it is understood that purchase of inertia starters is being investigated.

With regard to the stern gear, ships are being warned to pay careful attention to the lubrication of the stern bearing when running the engine out of the water. An A.F.O. covering the motor whaler will stress this point. Separate instructions are being promulgated to C.O.s of ships to fit internal greasing arrangements to these bearings, which at present have a grease nipple on the outboard side and which is difficult to reach when the boat in turned out at the davits.

New construction motor whalers now in hand are fitted with conventional clutches, gearboxes and propellers.

Motor Driven F.L. Pump—H.M.S. ' Murray '

When raising steam, the motor-driven F.L. pump was put to ' auto ' by the E.R.A. who was about to test the electric cut-in when he was called away for ten minutes. He returned to find the motor on fire. Apparently, this was due to the stator winding burning out through single phasing with one 100-amp fuze blown. Fuzing load is about eight times the running load, due to high starting load. It seems that what is required here is special heavy starting fuzes, automatically replaced by 15-amp running fuzes once the motor is on load.

The engineering point is that if one of these ships suffers a failure of either F.L. pump, then she stays cold in harbour until repaired, because failure of the other, even with main engine stopped, is likely to result in ruined turbine bearings through main turbine working temperature alone (as in *Diamond* in 1954). So *Murray* stayed in harbour for a few days in spite of the ingenuity of the E.O., who rigged his electric portable pump to act as a stand-by provider of F.L. pressure.

A.M.D., Leeds, and British Road Services made a miraculously rapid delivery of a complete replacement unit along snow-bound roads.

Comment

This defect was investigated and, while the electrical sequence of events leading to the motor failure could not be ascertained with certainty, it is considered probable that the failure of one fuze initiated the defect.

Arrangements have been made to replace the 100-amp fuzes by fuzes of 125-amp rating.

The provision of separate starting and running fuzes would result in more complicated and larger control gear and is not recommended.

A.B.C.D.—Second Training Squadron

The habitability of the boiler rooms when shut down to A.B.C.D., State 1A, is very bad. It is understood that there is an A.F.O. which says that, in such cases, the watch should be relieved every twenty minutes. This seems a regrettable kind of thing to do when under atomic attack. It would certainly be necessary. During *Murray's* recent annual inspection, both the Chief E.A. and his assistant on the main switchboard had to be helped to the sick bay and treated for heat exhaustion after about 45 minutes in the shut down boiler room. The boiler-room watch did not look at all happy. A temperature of well over 130 degrees was recorded in the humid atmosphere.

Comment

It is recognized that conditions in engine rooms and open boiler rooms under closed down conditions will quickly reach the limits of habitability : trials have shown that these conditions may be reached in 30 minutes or less, depending on the Class of ship, the state of the lagging and steam systems, and the ambient conditions. An A.F.O. stating that watches should be relieved every twenty minutes has not been issued, however, and the time factor will vary from ship to ship. One of the objects of ' closing down trials ' is, of course, to establish this time.

To facilitate longer periods of watchkeeping, a ventilated suit is being developed which will incorporate :—

(*a*) A cooled air supply

(*b*) Heat insulation for protection against radiant heat.

Although the suit is being designed primarily for heat protection, the exterior will be non-absorbent to prevent contamination of personnel.

Gearing—Second Training Squadron

Bearing dial thermometers are troublesome. The tube fitted to most of them is copper which tends to become brittle through vibration. During schedule or other examination of gearing bearings, thermometers are too easy

to damage beyond further use. Main gearcase inspection doors are in most places unsuited to the removal of dial thermometers without damage. Thermometers with flexible tubing, such as those on the cruising turbine input shaft bearings, should have been fitted. Positioning of access doors with this point in view requires consideration in new construction.

Comment

The tubing referred to is of copper coated steel and is very stiff. Quite often it is mistaken for embrittled copper. A different type of tubing is being used in all new construction and inspection doors have been repositioned to advantage.

For the Mark Is, nothing can be done to reposition the thermometers but if the distant-reading thermocouples prove successful, it is hoped eventually to instruct vessels to remove the thermometers and plug the holes.

Internal Combustion Engines—Second Training Squadron

(*a*) The A.S.R.2 Diesel alternator engine contains many 'heli-coil' type non-corrosive stainless steel screw thread inserts. These frequently require renewal during maintenance. No spares are allowed, and special tools are required.

(*b*) B.R. 1332(13), p. B5, item 8. Rubber sleeves inside the A.S.R.2 push rod strings are not allowed as spares although admittedly they are satisfactorily available from S.P.D.C. A buffer stock is required on board because frequent renewals are required.

(*c*) We have had a bit too much Diesel alternator sticky speed governor trouble. This is a great pity in these generally very satisfactory engines with their watchkeeper-saving automatic guarding panels. The trouble is caused by small particles lodging in the fine clearances of the oil-pressure operated speed governor. Paxmans say that the commercial specification calls for a suitable low differential strainer in the governor oil supply.

(*d*) A.S.R.2 aluminium alloy exhaust manifold inspection plate leakage continues to give trouble, although we have lately had very little cracking of the tap bolt face welding. The Squadron C.E.R.A. copes with cover plate leakage by renewing the inspection cover plates in much thicker brass or steel. This seems to cure the leaking, and to avert the tendency of the tap bolt face welding to crack.

Comment

(*a*) This problem is being pursued through the makers of the inserts, the engine makers and the refitting authorities, and it is hoped to make proposals in the near future.

(*b*) Stocks of rubber sleeves are on order and when they become available, the on board spares allowance for all ships fitted with Paxman YHA engines will be adjusted to include an allowance of 12 in. No. spare sleeves.

(*c*) The possibility of fitting a fine filter in the governor oil supply has been taken up with the engine makers and a modification will be introduced when details are finalized.

(*d*) This has been reported from other ships and Messrs. Davey Paxman are considering the design of a more robust door.

Main Engines—Third Destroyer Squadron

Lubricating oil, O.M.100, very easily becomes cloudy despite the fact that the oil temperature is controlled and that only a small quantity at a time is run down to the drain tanks. Tests show that the oil is clear of water.

In *St. Kitts*, the Hopkinsons separator discharges a white emulsion and not clear water. Separator speed and dam ring size have been checked and are correct. The separator has been used when available but has broken down twice due to electrical faults and three times due to mechanical faults; the

latter includes two failures of the bowl spindle upper bearing. This is a ball bearing and, since the lower bearing is a double row ball bearing, it is intended to fit a roller bearing at the top to remove the possibility of failure due to axial loading of the bearings thrusting against each other.

The Electrical Department consider that running conditions are too hot and that the casings permit oil leakage. A more robust design would seem desirable.

Comment

A mixture of oil and water cannot be rendered completely free from water by centrifugal separation alone. Under normal operation conditions, it is found that it is possible to reduce the moisture content to about 0·1 per cent. This is partly due to a trace of moisture being in solution at the centrifuging temperature which is precipitated on cooling, and to absorption from the atmosphere after discharge from the centrifugal bowl.

In *St. Kitts*, it appears that the bowl is out of balance due either to :—

(*a*) The bowl not seating correctly on the spindle

(*b*) The bowl itself out of balance; or

(*c*) The bowl spindle being bent.

These defects could also be responsible for the failure of the bearing, as well could be the following :—

(i) Buffer not working correctly, either being damaged or requiring renewal

(ii) Incorrect lubrication, causing etching of the ball race.

While the fitting of a roller race may for a time obviate further failure of the top bearing, the general running of the machine, as reported, seems to indicate that the machine is not mechanically correct. This will cause overloading of the motor and may be attributable to the non-complete separation of the water from the oil ; hence the white emulsion instead of clear water.

It is appreciated that these machines are prone to oil leakage, to the motor particularly, if the oil level is not regularly checked, and this point and the general robustness will be borne in mind in future designs.

Boilers—First Destroyer Squadron

(*a*) There have been many cases of feathering of safety valve pilot valves but this has normally been cured by reducing the width of the valve lid seats to not more than 0·025 in. as recommended in B.R. 1988, Art. 0418, para. 3. These narrow seats appear to be extremely susceptible to the smallest foreign bodies, such as scale, and there have been several instances of pilot valves leaking again after they have been floated.

(*b*) Experience in the Squadron has emphasized the importance of keeping clearances between the moving parts of feed regulators and check valves well within the design maxima.

Comment

(*a*) The reducing of the width of the pilot valve seat in accordance with the B.R. Article is considered to be the only means of curing feathering. This unfortunately, adds to the likelihood of particles causing trouble.

(*b*) Not only should the clearances given in the B.R. for feed regulators be followed for correct operation but the piston and seat diameters should remain as initially shown on the ship's drawings.

Air Conditioning Units—H.M.S. 'Loch Fada'

Six new units were installed at the last refit bringing the total to fourteen. Of the existing units, all except two were either replaced by larger plants or overhauled by dockyard or ships staff. Their subsequent performance has been very good ; the only major failure being a type 'A' compressor crankshaft bearings. This happy state has been largely due to the continual care and attention given to the plants.

The dust filters fitted have been invaluable and the only persistent chokage has been on the one cooler on which the filter has not yet been fitted. Hot, strong Basol has proved an efficient cleanser. The lower cabin flat cooler, in spite of its filter, needs removal for cleaning. Drawing its air from the main passage, its gauze chokes rapidly and the finest dust undoubtedly gets through and coats the grids.

Comment

Maintenance problems on self-contained air conditioning plants are well known. *Loch Fada's* record of trouble-free running, with continual care and attention, is noted.

The entry of dust laden air into ventilation systems is not the least of the problems associated with air conditioning, and even the most modern types of air filters must be removed at various intervals for cleaning, depending on the location of the plant.

Hull and Fire Pumps—H.M.S. ' Loch Fyne '

Trouble similar to that experienced in *Loch Fada* has been experienced with the loss of suction and sudden flooding from the air pump discharge of the hull and fire pumps. Research pinned down the saveall as ' the nigger in the woodpile '. The float-operated valve and block were stripped and cleared and the pump gland packed with flexible metallic packing, but the trouble recurred. Particles of red chromate, disintegrated cigarette ends, etc., were found round the valve and in the ports. The saveall suction was blanked and the trouble has not since recurred, neither has the suction valve been missed as there has been no further flooding.

The additional pump fitted was never very successful. On the first examination of the impellers, the wearing-ring clearance was found to be excessive (more than 0·020 in.). Eventually, the spare impeller and shaft assembly were fitted and the couplings were found to require a tapered shim between them.

The pump has since given satisfactory service. The use of whitemetal wearing rings in salt water pumps is surprising and in this case there was abundant evidence of deterioration of the material. It is suggested that Cormin rings would obviate this deficiency.

Comment by A.O., Colombo

The saveall suction could well be fitted with a S.D.V. for use when required. The suggestion that the whitemetal wearing rings be replaced by Cormin rings seems worth investigation.

Comment

Experience has shown that the sticking of the float-operated valve by foreign matter is more often primarily caused by the use of dirty water in the air pump reservoir than from any other cause. The resultant flooding via the suction side may add more foreign matter and thereby further the trouble. If due care is used in using only clean fresh water in the air pump reservoir and the provisions of A.F.O. 1742/57 are observed, the minimum of trouble may be expected.

Saveall suction pipes have been fitted to such pumps for a number of years and no adverse reports have been received regarding these as a possible source of contamination. It appears from A.O., Colombo's comment that the saveall suction valve has, in fact, been removed from the pump but no necessity is seen for this action as it cannot reasonably be expected that the saveall will remain dry during the life of the pump and, if this is suspected as a source of contamination, a fine mesh strainer could be improvised for fitting to the suction pipe inlet.

With reference to the material of the wearing-rings, spares for these are now supplied in leaded bronze, in lieu of whitemetal, and these should be demanded from S.P.D.C. when the present rings need replacement.

Domestic Hot Water Arrangements—H.M.S. ' Loch Fyne '

Hot water arrangements, when auxiliary, are totally inadequate. In view of the steadily mounting electrical load, the proposed solution to fit electric water heaters in the Captain's and W.R. bathrooms, is not concurred in. Completion of A. and A. 346, to fit Selectos burning equipment and A. and A. 365, to fit a hot water circulating pump, will certainly obviate the present peculiar distribution of hot water ; as fitted, the ships company can take all that the *Ideal* boiler can produce before the rest of the ship gets any. Surely a suitable controlled combustion central heating unit is available on the domestic market that would compete in price with the existing unit after modification. Furthermore, will not the forcing of the *Ideal* boiler result in a greater casualty rate of these cast iron monstrosities? Cannot the potential of a waste-heat boiler on the Diesel exhaust be reinvestigated and, if the result means corrosive condensation in the uptakes, do these uptakes have to be made of steel when the building industry are required by law to fit non-corrosive linings in domestic chimneys?

Comment

On completion of A. and A.s 346 and 365, a trial of the ships hot water system was carried out and although an improvement in the efficiency of the domestic boiler system was reported, it was considered that additional hot water supply was essential for the officers. Approval was given to fit a 25-gallon electric water heater in the officers' bathroom and supply was arranged. It is understood that at the request of the ship's officers the heater was not fitted.

While it is agreed that there are now more suitable domestic boilers in existence, it is understood that the existing 15D boiler, on being fitted with the Selectos burner (A. and A. 346) has given improved results with a reduction in casualty rate.

Capstan—H.M.S. ' Loch Fyne '

On the two occasions since commissioning that the Department has failed to meet the Command's requirements, the capstan was responsible. On the first occasion it was so thoroughly frozen that sailing had to be delayed two hours although two and a half hours had already been spent warming through.

On the second occasion the intermediate shaft sheared just as the anchor left the water. The fracture occurred flush with the large pinion and, in spite of optimistic efforts, was beyond the capacity of the ships staff to repair. A satisfactory replacement shaft was manufactured by Bahrein Slipway, using tailshaft steel.

Comment

Similar failures have occurred in *Burghead Bay*, *Loch Alvie* and *Cook*.

The use of merchant quality material was permitted as a war-time relaxation when these windlasses were constructed.

The design and size are considered adequate and replace shafts of Admiralty 'A' quality steel with ample radii machined at each change in diameter have given no further trouble.

Admiralty Letter D. 12434/55, to all refitting authorities (dockyards at home and abroad and all W.P.S.s) drew attention to the liability of this shaft to fail and called for careful examination at the next refit.

Boilers—H.M.S. ' Undine '

The left-hand main stop valve lid of No. 2 Boiler became detached from its spindle and, during subsequent steaming, the valve seat became damaged. It is thought that this defect was caused by the use of a badly fitted copper tab washer to lock the nut securing the valve lid to the spindle. Satisfactory repairs were carried out using a small portable pneumatic grinding machine supplied with air from the ships Diesel-driven L.P. air compressor. The final grinding

was carried out using a dummy valve, spindle and bridge. During these operations, a tight fitting wooden plug, placed in the valve seat, prevented the ingress of metal grindings, etc., to the boiler. A monel metal tab washer has now been fitted. The right-hand main stop valve of this boiler was found to be in a similar condition, the valve lid securing nut having slacked back so that only two threads remained to prevent the valve lid from becoming detached from the spindle.

Comment

Attention is called to B.R. 1988, Art. 0447. Monel metal washers are not recommended and in view of reported troubles with copper washers, only soft iron washers are permitted for new construction. The B.R. is being amended to permit the use only of soft iron washers.

The use of portable pneumatic grinding equipment for repairing valve seats is noted with interest.

Hull and Hull Fittings—H.M.S. ' Mounts Bay '

The organization and ability of the dockyards and ships staff are entirely adequate under normal operating conditions to maintain the machinery of the ship in good working order. It seems a pity that the maintenance of the hull and hull fittings by the dockyards and ships staff does not measure up to the same standard. This results in the ' hull ' letting down the rest of the ship. A particular example is the preservation of the flat keel. In two cases the flat keel has corroded through at sea and this can be partially due to the fact that it is not surveyed at dockings. When docked down, approximately 60 per cent of the keel can be seen and this is duly coated with protective and anti-fouling paint. The part of the keel on the blocks receives no treatment at all and, particularly towards the stern where the blocks are closer together, corrosion sets in. This results in embarrassing failures which can also be expensive, such as when the electrical spare gear store flooded from sea and more than 20 per cent of the spare gear was ruined. It is suggested that keel blocks should be removed one by one at least at alternate dockings.

Comment by F.E.O.

Consideration should be given to this suggestion especially in view of the lighter scantlings of new ships.

Comment

As similar keel plate troubles have been reported in other *Bay* Class frigates, A.F.O. 1382/56 was promulgated. It will be seen that the existing regulations have been stressed regarding cleaning and coating all underwater portions of the hull, particularly those portions which are normally resting on closely spaced or ' solid ' blocks, and that instructions have been issued to take action when ships are due for docking.

Boilers - H.M.S. ' Mounts Bay '

Wastage of cone bricks has continued to be severe and after a total of 2,700 hours' steaming the front walls of both boilers require renewal.

Getting at the nuts of the bolts securing the cone corner bricks (A.P.394 W) and the bricks between the cones involves a considerable amount of stripping of the casings round the registers and, as a result, the millboard lagging suffers.

Comment

Trials are being carried out in various ships to determine whether plastic throats are an improvement on the brick arrangement but no conclusions have yet been reached. The fitting of plastic on castable throats would require the manufacture and supply of formers.

Spare Gear—H.M.S. ' Mounts Bay '

The laborious task of mustering all the spare gear was undertaken before turning over to the new crew.

This seems to be an appropriate place to record the gratitude of the Department of this ship to the last Captain-in-Charge and the staff of S.P.D.C., Eaglescliffe, for the very excellent service given by them. Their Naval Stores successors have a high reputation to live up to.

Comment by F.E.O.

It is a pleasure to forward this spontaneous tribute to the S.P.D.C. (U.K.) ; it is equally true that since September, 1957, spare gear for H.M.S. *Lynx* has arrived without any undue delay.

Comment

Noted with pleasure. Naval Stores Department are making every effort to improve the S.P.D.C. service whose past performance was often only brought to notice when they fell below expectations. .

S.E.O.'s Remarks—Sixth Destroyer Squadron

Since ships have been fitted with the 150 kW Diesel generators the maintenance state has been improved. There are two points worthy of note, however, as a result of experience of the past commission. These points, which apply mainly to the *Ca* modernized ships, are as follows :—

(*a*) It is essential to carry out gunnery tests in harbour. These tests require a steady voltage and hence it is essential to use the ship's generators. The normal load when carrying out these tests, cooking food, etc., is just more than that with which one 150 kW Diesel generator can cope. What a pity these ships were not equipped with 200 kW machines, particularly as the engines are capable of this output.

(*b*) Gunnery and torpedo tests, examinations, etc., require high-pressure air at 3,000 lb/sq in. for harbour maintenance. This requirement is beyond the capabilities of the Diesel-driven compressor fitted mainly for Diesel air-starting requirements. The only other compressor available is steam driven. It is considered that future modernizations should incorporate an electrically driven compressor to replace the steam driven machine.

Comment

(*a*) As originally planned, the harbour load could be met by one 150 kW Diesel generator with the other stripped down for maintenance. This principle was approved in the Staff Requirement for the *Ca* modernizations. Subsequent additions and revisions of gunnery and radar equipment have increased the load above the capacity of one machine.

(*b*) This point is appreciated and where the electric generating capacity and the available money allow, is implemented at modernizations.

Spare Gear—H.M.S. ' Burghead Bay '

The service of spare gear ordered direct from S.P.D.C. (U.K.) or S.P.D.C., Simonstown, has been satisfactory. It is suggested that more use might be made of air freight for small items where the requirement for delivery is stated on the demand to be six weeks or less.

There seems to be a tendency when transferring spare gear to naval stores to split up sets required as such for a particular purpose and insert them in the *Rate Book* under different groups and with different descriptions. This

may be an advantage from a procurement aspect but it is a source of great inconvenience to the user who may be unable to identify items from the *Rate Book* description.

Comment

Air freight is generally used whenever deemed necessary to meet the stated delivery date. Owing to high cost, however, this method is used only when it is fairly certain that programmed sea freight will not meet the requirements. Since despatch methods from S.P.D.S. are outside D.M.E.'s control (A.F.O. 1767/57 refers), any further instances of late delivery due to the use of sea freight should be reported officially through normal channels.

With regard to the transfer of spare gear to naval stores, it is not clear what store items the ship has in mind. However, it is essential from a storekeeping aspect that individual items are inserted in the group appropriate to that type of item. Care is also taken to describe the item by its 'basic' description, ignoring where possible its application or function ; the item may have only one function in one particular ship or equipment but may have a different function in another ship. Identification difficulties that arise may well be due to the original spare gear description not being basic.

It should be noted that as spare gear cataloguing proceeds spare parts identification will be a basic rather than functional description ; manufacturers are being pressed to ensure that their drawings, parts lists, etc., also conform. Once this is done transfer of items to naval stores should not necessitate changes in description.

Main Condensers—H.M.S. 'Burghead Bay'

Tube packing failures have occurred on two occasions and all the failures have occurred in the top rows of tubes. Records held on board are incomplete but it is certain that only the tube packings that have failed have been renewed since 1954, possibly earlier. The condensers have not been degreased since this date.

The following suggestions are put forward :—

(*a*) *Causes of Failure*

(i) For a proportion of the time when the ship was in dockyard hands and in Reserve (December, 1955—March, 1957) the sea water sides of the condensers were drained.

(ii) The ship has steamed for considerable periods in tropical waters.

For these reasons the tube packings have deteriorated to a point where failure is now likely to occur at the hottest part of the condensers (i.e. the top) whenever high sea temperatures are encountered. Evidence to support this comes from the fact that the failures mentioned occurred when the sea temperature rose to about 90 degrees F.

Large increases in power and sustained high-power steaming in temperate waters have produced no failures, presumably because the critical condenser working temperature to produce failures has not been reached under these conditions.

(*b*) *Remedies*

(i) The salt water sides of condensers should be kept flooded whenever possible.

(ii) The whole of the tube packings should be renewed at intervals, regardless of whether tests show them to be tight. For ships likely to operate in tropical waters, a suggested interval is every second refit.

Comment by F.E.O.

The proposal to renew tube packings at regular intervals is considered sound, at least as far as the top rows of tubes are concerned.

Comment

Lack of other reports in the D.M.E. Division suggests that this is an isolated case. Further reports on Forms S.2022 from ships would be welcome.

With regard to (*b*) (i) above, this procedure is officially recommended (B.R. 16, Art. 146 refers) but the tubes and tube plates must always be well washed on these occasions before the condenser is flooded up again.

It is possible that continued failure in the top rows of tubes is connected with poor steam deflection arrangements inside the condenser.

No evidence has yet accumulated to suggest that regular repacking of condensers would be desirable.

Boats—H.M.S. ' Loch Fada '

Both Enfield motor boat engines have given reliable service. The reduction of the governed speed of the H.O.2 (A.F.O. 1671/57 refers) caused some loss of pride to the ship. The intermittent knock of the engine, similar to that reported by *Loch Lomond*, has occurred with this engine also without explanation except that it does seem to occur with high temperatures. The throttle cable has also proved too weak and has been replaced by a spare length of cable from the bridge helm indicator drive which, if somewhat sluggish, is much stronger.

Comment

Intermittent knocking of Enfield H.O.2 engines has been experienced in the past and the main cause was found to be dirty or sticky injector needles.

All new construction 25-ft M.C.s are installed with Bloctube controls but the instance quoted—that the Bowden cable is too weak—has not appeared in the Department's records.

Rags—Third Destroyer Squadron

More selection should be given to the type of material included in baled rags. Burberry cloth is 100 per cent non-absorbent.

Comment

Trials of superior quality rags have been completed and a revised specification has been prepared. The purchase of future requirements for rags, to this new specification, is now under discussion with technical departments.

ORDNANCE ENGINEERING

Comments by D.G.W. and D.F.M.

C.R.B.F.D. Mk. 5—H.M.S. ' Victorious '

The director was observed to be ' hunting ' when accelerating to training slewing speeds. On investigation it was found that one of the leaf springs associated with the anti-topple gear for the gyro had fractured. The spring was replaced, and the director then operated satisfactorily.

The director had only been in service one month since O.G.C.T.s when the defect developed. There is no evidence in the ship that this is a recurrent defect, but it is understood that it is generally quite common. It is suggested that redesign of the spring be considered.

Comment

The design of this spring is common to other Mks. of C.R.B.F.D., and to S.T.A.A.G. mountings. Discussions have been held with manufacturers and dockyards refitting such equipments, but all concerned state that they have had no cases of breakage. Dockyards are, however, aware that this does occur from time to time in ships, and have noted that the springs usually break in line with the edge of the backing piece used in securing the spring. Since there is only 0·050 in. between the hole for the inner securing screw and the edge

of the backing piece, it is probable that there is a tendency to failure at this point. Modifications are being introduced to extend the backing piece by 0·125 in. along the spring, to give greater support.

4·5 in. Mark 6* Mounting Power Rammer—H.M.S. ' Diamond '

Recent recurrent failures of power rammer operating gear have led to the discovery of four cases of twisted recocking spindles. The direction of twist has been variable, suggesting that deformation may be caused by either over-cocking or trying to recock in the wrong direction. The effect of twisting has been the failure to reverse the position of the control valve spindle, resulting in the rammer remaining in the forward position.

It is understood from previous correspondence on similar failures in other ships that replacement spindles of a higher grade steel are available. It is requested that such replacements may be supplied.

Comment

There have been a few similar reports in the past. It is possible to exert excessive twisting force on the spindle, due to the length of the hand lever, and the fact that some sailors are stronger than others explains the sporadic nature of the defect.

Replacement spindles are being supplied, of V4A steel in place of the original V3 steel. Drawings for the equipment are being amended accordingly. In view of the relatively unusual nature of such failures, however, a retrospective modification will not be introduced, and spindles of the new material will only be fitted as and when further failures occur.

M.S.R. 8 Dual Ballistic Unit—H.M.S. ' Diamond '

Six months ago a complete set of new gaskets was fitted to the oil servo units in the computing drawers of the D.B.U. During the past few weeks all these gaskets have blown in a similar manner. Characteristic distortion of the web between the two larger ports has taken place, with consequent ' opening up ' of the other ports.

It is suggested that the web is not strong enough to withstand the pressures experienced within the unit. It is also considered that the gasket is not thick enough for the job, and that the position and size of the servo unit bolts are not sufficient to permit adequate bearing pressure to be applied over the whole surface of the gasket (the bearing pressure is least in the region of the web).

A thicker gasket would reduce the chance of recurrence, by allowing a greater tightening effect. Added strength could be given to the gasket by embedding a fine wire mesh in the material at suitable positions. In addition, spare gaskets should be supplied to ships.

Comment

Leakage has been experienced during trials of early production models of the D.B.U., and as a result of the subsequent investigations a number of modifications were made to manufacturers' drawings. In later models, three 1/32 in. square section grooves are milled on the joint faces of the relay bodies to reduce the risk of failure of the gaskets. There have been no other reports from sea of undue gasket failure in the early D.B.U.s, and retrospective modification has not been authorized for these units. Spare gaskets are included in A sets, but supply of these sets has unfortunately been unavoidably delayed. The supply situation is now much improved.

4·5 in. 5* Mod. 1 Mounting—H.M.S. ' Cavalier '

The throw-over spring assembly is connected to the loading tray of the mounting, when pinned to power swing-in, by a bracket welded to the loading tray and a lug welded to the bracket. During a loading cycle, the weld securing the lug to the bracket failed. This occurred after a shell and cartridge had been

rammed, i.e. immediately after removal of the right hand release bolt.

It is considered that the failure was caused by poor welding which had not penetrated either component. It is suggested that the arm could be made all in one piece, with additional strengthening webs at the change of section which occurs where the lug joins the bracket.

Comment

The relative strengths of fabricated and solid brackets are always dependent on the quality of the workmen employed in manufacture. Welding techniques are still developing rapidly, and experience in such work is inevitably of a relatively low standard in a few cases. Every effort is made, both by Admiralty representatives and by manufacturers, to ensure that welds are of good quality and recent improvements in inspection techniques, etc., should reduce the likelihood of such failures.

Although this particular failure was most probably due to inferior welding, there have recently been doubts of the figures used by designers in calculating the strengths of welded structures. It is possible that there is some room for further improvement in this field, and the question is being re-examined. Meanwhile, there seems little hope of arresting the present tendency towards fabrication in place of forging.

S.T.A.A.G. Mark 2M Mounting—H.M.S. 'Solebay'

During routine testing of the safety firing gear, the shaft rotating the 'plateau' cam for mounting training was found to be fractured. Fracture had occurred at the limit of the key-way for the sliding worm-wheel and the lower portion had become trapped under the carriage carrying the plateau cam as it moved vertically for gun elevation.

The shaft was passed to the Dockyard Metallurgical Laboratory for examination, and the following report was received :—

Metallurgical Report

The fracture shows a medium crystalline structure but there is evidence of a gassy and oxidized melt.

Chemical analysis of the material gives a composition of 9·64 per cent tin, 0·2 per cent lead, 2 per cent zinc, 88·1 per cent copper. This meets the British Standard Specification for this gunmetal.

Mechanical tests show that the U.T.S. of the material is 13·5 tons, and the elongation 7 per cent. The specification for the material demands not less than 16 tons and 12 per cent respectively.

A longitudinal macrosection through the fracture shows gross porosity.

In order to ensure early discovery of any repetition of this dangerous failure, before firing routines have been extended to include checks of the gear at six selected angles of training and elevation.

Comment

It is clear that a faulty piece of metal was used in the manufacture of this shaft. However, the shaft had performed satisfactorily for a considerable period before failing, as might be expected from the metallurgical report.

There have been no other reports of similar failures, and in the circumstances this can only be regarded as an isolated instance unlikely to recur.

G.R.U. Stabilizer Mk. 3—H.M.S. 'Tenby'

On starting the stabilizer, the unit was run up in the normal manner, but when the G.R.U. armatures were switched on the 'top hat' toppled. It was noted that the gyro power supply unit 'output correct' lamp failed to burn, but this was attributed to dirty contacts.

Investigation showed that the upper gyro had seized, and there was a black deposit on the underside of the rotor. The gyro was removed, and the lower bearing ball cage was found to be shattered. The cause of the failure was not apparent.

Comment

Shortly before this failure was reported it was found that a large number of the gyros used in these stabilizers had been impregnated with an adulterated varnish during manufacture. The varnish did not set properly, and would very slowly 'run' in service; the gyro lower bearing naturally received some of the deposits, which would destroy the lubrication and hence damage the bearing.

The impregnation has been corrected for gyros of new manufacture, and stocks of replacement gyros are being built up. In view of the sporadic nature of such failures, and the difficulty of determining the quality of the varnish after it has been applied, it would be impracticable to take further action.

4·5 in. Mk. 6* Mod. 1 Mounting—H.M.S. 'Torquay'

Investigation into the poor training performance of the mounting indicated that much of the trouble arose from ingress of air into the hydraulic system. It was decided to re-joint the system, and during the course of this work one of the connecting pieces to each of the three-way connecting blocks was found to be fractured, and the replenishment pump casting in the training system was broken at the neck of the relief valve on the three-way oil block.

It seems probable that these defects were caused by excessive vibration and distortion of the training roller path as previously reported.

Comment

Distortion of the training roller path of the mounting in question is still under investigation, but there is no doubt that it has had some effect on the performance of the equipment. However, a defective Mk. 8 series resetter box was found to be the main cause of the mounting's jitter and poor performance. Similar reports from *Daring* Class ships at an earlier date had led to a modification to strengthen the three-way blocks, and the modified components have not given trouble. It is considered that the severe condition of prolonged vibration experienced in *Torquay* would not normally be encountered, and that no further modifications are required.

4·5 in. Mk. 6* Mod. 1 Mounting H.M.S. 'Lynx'

After extensive refitting of the general service hydraulic systems on both the fixed and the revolving structures, a trial was carried out consisting of the timed passing of a hundred rounds through each hoist. During the course of the trial, due to a combination of bad drill and maladjustment of the loading tray door buffer, the door catch of one of the shell hoists failed to operate: the door 'bounced' while the hoist was commencing an up-stroke, and the moving pawl did not properly engage the base of the shell, which fell back approximately five inches on to the floating lever. The floating lever fractured between its top edge and the edge of the brass rubbing strip securing-screw hole nearest the lever fulcrum. At a later stage in the trial, an identical failure occurred on one of the other shell hoists.

The cause of the defect lies in the method of fitting the rubbing strip: the metal between the tapped hole and the edge of the lever being only one-eighth to three-sixteenths of an inch thick. It is suggested that a new method of attachment be used—for example, brazing.

Comment

The floating levers in both shell and cartridge hoists of these mountings have given trouble in the past, and the brass rubbing strip was introduced as a

modification to overcome lateral bending of the levers. It has become clear that the lateral bending was a result of an inherent weakness in the lever, rather than excessive lateral clearances, and subsequent to modification there have been failures due to slackening of the rubbing strip securing screws, vertical bending of the levers, and fractures through the securing-screw holes.

As a result, action is being taken to provide replacement levers of an improved design, manufactured from a material of greater strength and without a rubbing strip.

Mk. 6M Director—H.M.S. 'Chichester'

Extreme difficulty was experienced in removing the nuts and locknuts from the ends of the upper guide bolts for the joystick control unit of the director, owing to the lack of accessibility for tools or hands between the unit and the shield of the director. The cover plate of the unit was also difficult to remove, being a sunken fitted plate.

It is suggested that the nuts be replaced by a further threaded section to fit the forward lugs; this would have the same effect as the locknuts, which only prevent the unit being fully withdrawn as soon as the securing bolts are undone. Alternatively, easily removable stops could be fitted to the underside of the unit to engage with the lower bolt securing lugs. The cover plate should be provided with a small lifting handle or a threaded hole for a withdrawing bolt.

Comment

The unit is designed so that it can be secured in a withdrawn position for inspection and servicing, or for disconnecting the wiring if the unit is to be removed. The upper guide bolts are rendered captive by the locknuts so that the unit is not inadvertently removed before the wiring is disconnected. The inaccessibility of the locknuts has been investigated, and it is agreed that a modification is required. A suitable modification is being incorporated in directors in production, and similar arrangements will be made for equipments already in service.

MAIN CONDENSERS, DE-GREASING—H.M.S. 'CARDIGAN BAY'

Frigates of *Loch* and *Bay* Class whose machinery is wholly reciprocating suffer unavoidable grease contamination on the steam side of the main condensers and the water side of the air pumps.

The following method of de-greasing by ships staff at short notice has been tried with most satisfactory results, the ship being alongside on shore power:—

(1) One boiler alight, closed exhaust opened to atmosphere.
(2) Fill main condensers to cover top tubes with feed water or good shore water on steam side. Leave manhole covers off.
(3) Introduce a solution of 30 lb of boiler compound strained into each condenser.
(4) Boil up each condenser by means of the coil steam drain from the evaporator—the plant not running—but the live steam passing straight through the coils and, via coil drain, into the condensers.
(5) Shut off steam when temperature of solution in the condensers reaches 180 degrees F. and run associated air pumps to extract the 'condensate'.
(6) Allow discharge from air pumps to run to bilge by breaking convenient pipe joint, or some other simple method.
(7) When condensers are empty, refill with a fresh supply of feed or good shore water and wash through, again running air pumps.

All trace of grease was removed by this method and improved vacuum conditions have been achieved.

Care must be taken that the temperature of the solution in the condensers does not exceed 200 degrees F., otherwise softening and distortion of the

ebonite bucket rings in the air pump will result.

The sea water side of the condensers was flooded throughout the operation.

REPORT OF TRIAL BURNING DIESEL FUEL IN STEAMING BOILER—H.M.S. 'HOGUE'

The object of this trial was to investigate whether undue difficulty would be experienced burning Diesel fuel using a combustion system designed for normal operation using F.F.O.

The trial took place with the ship steaming at 100 r.p.m. with normal F.F.O. consumption of 2·2 tons/hr.

The conduct of the trial could be considered in three phases :—

(*a*) The change over from F.F.O. to Diesel fuel

(*b*) The period burning Diesel fuel

(*c*) The change back from Diesel fuel to F.F.O.

Phase (*a*)

It was considered that the difficulty in this change over would lie in arranging that the steam heating for the fuel be discontinued at the right moment. A time interval was calculated from the rate of consumption of fuel and an estimate of the volume of oil in the suction pipe. When this time interval had elapsed, after the suctions had been changed over, the steam was shut off the F.F.O. heaters.

Confirmation that a high proportion of Diesel fuel was coming through was given by a marked alteration in the shape of the flames in the furnace and by a change in the appearance of the F.F.O. pump plunger rods which appeared to have a brighter film of oil when Diesel fuel was being used.

There was a slight tendency for pulsation to occur during the change over, but pulsation never became established. Combustion otherwise remained stable.

Phase (*b*)

While Diesel fuel was being burnt, the flame appeared to be shorter and fatter but the primary and secondary flames were quite stable. When a wing sprayer was used there was a tendency for the flame to enter the tube nests but the flame appeared satisfactory and combustion was complete within the furnace when other sprayers were used.

The air pressure for a clear funnel did not appear to be critical when Diesel fuel was in use. The oil fuel pressure required for the load was ten pounds lower than when using F.F.O.

Diesel fuel was burnt for one hour and the funnel temperature did not rise.

Phase (*c*)

Again a calculated time interval was allowed to elapse between changing over suctions and putting steam on the heater. Stable combustion was maintained throughout. The arrival of the F.F.O. at the sprayers could be observed by the lengthening of the flame. Again there was a slight tendency for the boiler to pulsate.

Conclusion

Provided that the heating of the fuel is shut off and restored at approximately the right times, no difficulty is experienced in changing over from Diesel to F.F.O., or vice versa.

The system was carefully inspected for leakage. One valve spindle gland required tightening.

The consumption appeared to be the same as when burning F.F.O., but the length of the trial did not permit accurate observation.

After arrival in harbour, the ship steamed auxiliary for twelve hours using Diesel fuel. The same method of changing over was again employed. No difficulties were experienced.