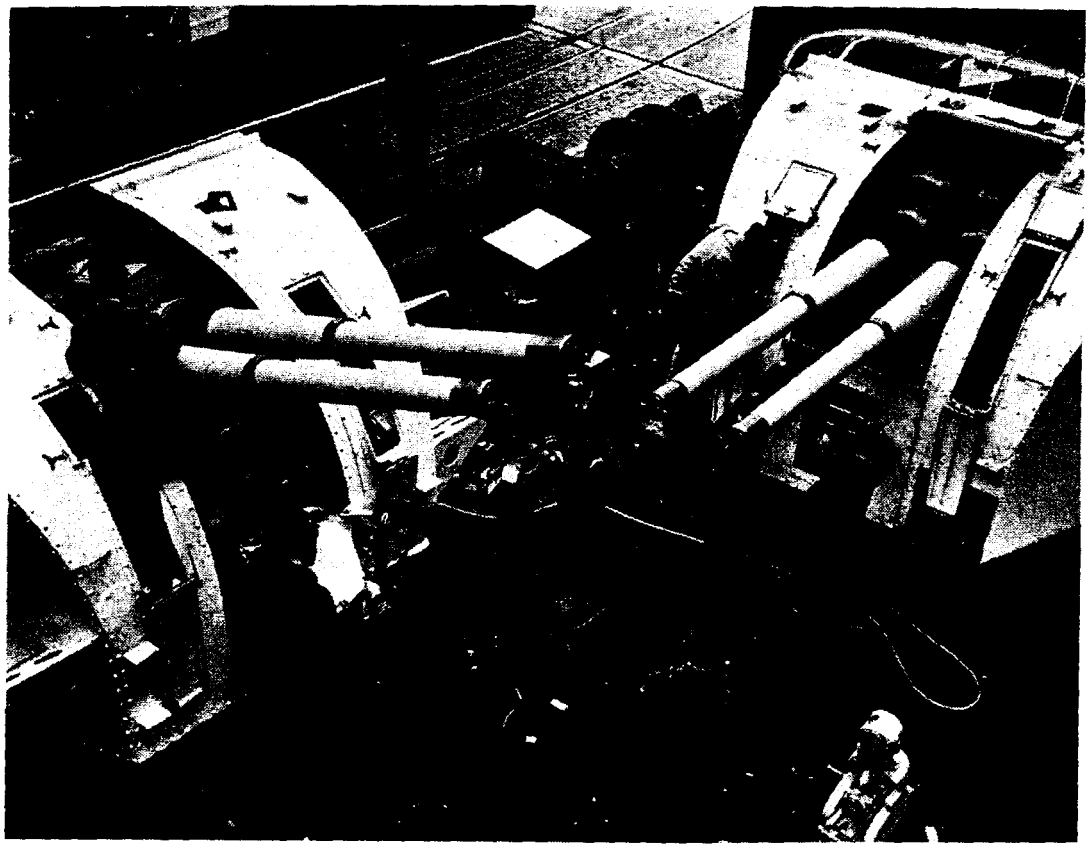

THE GUN MAINTENANCE SHOP, H.M. DOCKYARD, CHATHAM

NOTES FROM SEA

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

MARINE ENGINEERING

Comments by E.-in-C.

Flexible Couplings—H.M.S. ' Ocean '

As a result of visual examination of the port H.P. turbine flexible coupling, before the refit, which showed some scoring on the dog faces, it was decided to examine the starboard H.P. coupling. On opening up, the working surfaces were covered with a light, brownish deposit, thought to be a culmination of sludging from the oil and rust. Hammering which had taken place had caused the oilways cut in the male dogs to jump up corresponding marks in relief on the female claws. Surfaces were honed flat, oilways were cut to the correct depth and corrosion products were removed.

During the partial repair trial, at 202 revolutions, it was noticed that the axial vibration of the port shaft was such that the whole main thrust block casing was oscillating with an amplitude judged by eye to be approximately $\frac{1}{8}$ in. and was being transmitted to the gearing, as could be heard from the cyclic noise variation. Should the flexible couplings be binding at all, this movement would, in part, be felt by the turbines as well. No unusual temperatures were recorded at the thrust and adjusting blocks. This phenomenon had

never been noticed before, but shaft vibration is an inherent failing of light fleet carriers and it cannot be said that the flexing of the thrust block supports is new. However, it accentuates the importance of ensuring that the flexible couplings are quite free to move axially. A. and A., Item 530, the fitting of resonance changers to the thrust blocks, was progressed during the refit to the extent of delivering the gear, and it remains to be seen whether they will improve the situation when fitted.

Comment

The need to examine all flexible couplings is concurred in. The scoring and hammering is undoubtedly due to shaft vibration which is common in starboard, but not in port shafts. It may be confidently expected that resonance changers will make a considerable improvement.

Automatic Feed Regulators—Sixth Frigate Squadron

Of the four ships, all fitted with Weirs Improved Steadiflow feed regulators, only *Ursa* claims to have no problem but admits difficulty in maintaining a steady water level with only two sprayers flashed. *Undine*, *Ulysses* and *Urania* do the majority of their steaming on hand feed. One particularly baffling aspect of this problem is that there are periods when the regulators function perfectly and suddenly become erratic for no good reason. Checks have been carried out in accordance with A.F.O. 2293/55. Investigation and experiment continues. There is no doubt that watchkeepers have completely lost confidence in their feed regulators and prefer to feed by hand—at which they are very expert.

Boats—Sixth Frigate Squadron

The 16-ft F.M.B. could be dispensed with. There is no adequate stowage for it and it is difficult to hoist in and out.

Spare Gear—Mediterranean Flotillas

Most spare gear is now arriving marked only with the new Admiralty Interim Catalogue number. However, the catalogues held by ships are not yet complete, and most parcels, beautifully packed, have to be opened to check their contents. It is recommended that the remaining pages of the catalogue should be hastened.

Comment

The practice of breaking open packages is to be discouraged and should be unnecessary. Copies numbers 3 and 4, of the demand form are normally marked by S.P.D.C. with the Admiralty catalogue number against each item. Until full sets of catalogues are held, it is recommended that ships enter on the D. 787J pages any Admiralty catalogue numbers that become known to them.

Diesel Generators—H.M.S. ' Loch Lomond '

A 2,000-hour routine has been carried out on the Paxman 12 R.P.H. Diesel generator very satisfactorily. Approximately three weeks were required by one mechanician, with assistance from the C.E.R.A., and occasional interruptions. Its condition was generally good, though all rings required renewal and one piston had to be replaced because of a blow-hole. No difficulties were encountered. The question now arises whether the dockyard will undertake a major overhaul at Chatham when, by that time, the Diesel will have run about 2,500 hours—i.e. 1,500 hours short of the normal period. If they don't, this routine will become due half way through the new commission, when there will not be the facilities available to undertake it.

Comment

The question of refitting generators in anticipation of their future service is under review. It is obviously desirable that a ship leaving U.K. for a foreign commission should do so with zero hours on her generators. It may, in certain circumstances, be possible to provide facilities to enable major overhauls of generators to be undertaken during intermediate docking or self refit periods.

Boilers—H.M.S. ' Loch Fada '

A Silvoflex hose burst recently, fortunately causing no damage. The hose, a comparatively new one, was not due for test but enquiry revealed that the Patt. 25A sprayer to which it had been attached was not fitted with a stop to prevent the rotation of the sprayer body when operating the hose coupling screw. When tightening or releasing this screw, it had become a habit to steady the sprayer by grasping the end of the hose. It is considered that the burst is attributable to strain caused in this way, the position of the burst being consistent with this explanation. A second sprayer in use was also found to be without this stop. (A.F.O. Diagram 37/54 (3) refers.) As a precaution, all Silvoflex hoses were renewed forthwith. It is felt that this matter should be taken up with D. of S., and that a warning might be issued in A.F.O.s.

Comment

Personnel should be familiar with this equipment and know when a part is missing from the sprayer. However, the matter of stops for Patt. 25 and 25A sprayers is being taken up with D. of S.

Main Refrigerator—H.M.S. ' Loch Fada '

In addition to the Sterne machine previously fitted, a Hallmark compressor-condenser unit was installed, before commissioning, as a stand-by unit, using the existing gas circuit. This unit ran successfully on trials, but the delayed effect of a porous condenser tube plate was not detected until some six weeks later when, on the next occasion of using the stand-by plant, the entire gas system was flooded with salt water. This incident fortunately occurred at Portland within a few days of returning to Portsmouth for the summer leave period. Portsmouth Dockyard, who were extremely helpful, removed the entire plant and system from the ship, replaced the faulty condenser, refitted and cleaned all components including both compressors and finally de-hydrated and pressure tested throughout. No trouble of any consequence has been experienced either with the Sterne or Hallmark machines since. The brine pump has been examined recently and shows little sign of wear. Nevertheless, in view of the indispensable nature of this item, the provision of a spare pump and motor is strongly recommended.

Comment

It is hoped to obtain approval for Loch and Bay Class frigates serving on the East Indies and West Indies stations to carry a complete spare brine pump unit. The pumps cannot be made available for 12 to 18 months from the date of order and, as an interim measure, action has been initiated to obtain approval for those ships to carry additional spares. These spares, together with the spare gear already carried, will enable all parts of the moving element to be assembled and ' fitted ' for ease of assembly, before they are actually required.

Diesel Generator—H.M.S. ' Loch Fada '

The Parsons 12 R.P.H.2 engine has given excellent service and seems to be a most satisfactory design. A 2,000-hour routine was carried out, although the hours had reached 2,600 before this could be started. The engine was found to be in very good order although the centre-rod (single end) big-end bearings had worn to their limits and could not have run much longer without renewal. A heavy sludge of rubber was found in the heat-exchanger tube nest ; this had come from the hose connections on the hot water side which showed signs of internal spongy deterioration. Renewal of these connections should be carried out, although not listed in the schedule.

All the wear-downs required by the schedule were recorded, although this was possible only by borrowing an 8-in. micrometer from Trincomalee Dockyard and using a privately owned vernier gauge. It is thought that the 2,000-hour routine could safely be extended to 2,500 hours.

Lack of space and facilities present many difficulties in the 2,000-hour routine. The lack of proper lifting eyes in the Diesel room deckhead called for some ingenuity, and practically no other work was possible in the small workshop while Diesel parts took possession. At present the ship is only allowed one 2-in. outside micrometer by establishment ; the provision of an 8-in. micrometer for this and other work is really a necessity. A Black and Decker machine in Trincomalee Dockyard saved much laborious valve grinding.

Comment by A.O., Colombo

Frequent inspection of the inside of the hose connection on the hot water side should be carried out and renewal listed on the schedule.

Comment

No previous case of deterioration of hoses has been reported. It is possible that the hose in question was not a maker's spare.

Increase in allowances of micrometers and similar tools has been approved and supply will be made in due course.

Frigates will be allowed the following :—

Dial Gauge Test Set	—New Patt. No.
Clock Gauge—Crankshaft alignment	—Patt. 5621
Inside micrometer 2-in. to 12-in. to be eventually replaced by 2-in. to 32-in.	—Patt. 3872
Outside micrometer 4-in. to 8-in.	—Patt. 2394
Outside micrometer 0 to 4-in.	—Patt. 2393
Outside micrometer 0 to 2-in.	—Patt. 770B
Morse Reseating Gear	—Patt. 10

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

Before the docking period at Colombo, constant trouble with the 20-ton Worthington-Simpson pumps was experienced from worn float valves and associated link gear. The forward pump would habitually pump air into the firemain with explosive results in the officers heads, while the after pump would lull one into a false sense of security before flooding the flat at dead of night. Since then, both pumps have been refitted, one by Messrs. Walkers and the other by ships staff. Results have been satisfactory in both cases, although a neat fitting float controlled valve in the after pump was inclined to stick. The lands of the valve were relieved by turning three shallow water grooves in each, which solved the problem.

This type of pump, of conventional Worthington-Simpson or Drysdale design, appears to be one of the less satisfactory of the standard machinery fittings in H.M. ships. Their performance on main suction is usually unreliable and they not uncommonly cause a flood. Their rapid rate of wear, especially in the float gear, results in considerable ships staff maintenance and an almost guaranteed place in every defect list. It is to be hoped that an improved design will soon be found.

Comment

The matter has been referred to D.N.C.

Boilers—H.M.S. ' Hardy '

The boilers were not externally cleaned by the contractors and have now been in service for twelve months, except for the saturated block of tubes which was renewed shortly before commissioning. This may account for the rise in air pressure required at full power, viz. :—

Contractors sea trials : Sept., 1955,
23 in. at 3,570 r.p.m. on blower

Acceptance trials : Dec., 1955,
29·2 in. at 3,570 r.p.m. on blower

Vibration trials : Feb., 1956,
29·5 in. at 3,570 r.p.m. on blower
(All figures average for both boilers.)

Comment

The increase in air pressure required for full power is almost certainly due to failure to clean externally. It is pointed out that the specification for these boilers, Art. 18.3.1., states that the fire-side surfaces are to be cleaned and examined after trials.

Auxiliary Boiler—H.M.S. ' Hardy '

This has not yet passed its acceptance trials. There does not seem to be any method of cleaning the generator tubes externally other than removing the combustion equipment in its entirety. This is a big job.

Comment

The combustion equipment has to be removed for cleaning, and this is the accepted method.

Turbo Generators—H.M.S. ' Hardy '

On three occasions the extraction pump has lost suction when the machine was running on light or no load. The condenser has then filled up and the machine has been stopped by the vacuum trip gear. Explanation :—When running light the capacity of the extraction pump is sufficient to empty the condenser, despite the action of the back pressure valve. With the condenser empty, the discharge pressure on the extraction pump falls to zero, then rises to 10–15 in. vacuum. This in turn cuts off the supply of sealing water to the extraction pump gland and air is drawn into the impeller casing. It seems that an air lock then forms in the impeller. If sufficient condensate collects in the condenser before the air lock becomes too big, the extraction pump will pick up suction again and empty the condenser. If, on the other hand, only a small

quantity of steam is entering the condenser, the impeller has time to become completely air-locked before sufficient condensate has been formed to prime the impeller. If this happens the condenser fills completely, while the extraction pump discharge gauge continues to register a vacuum. The situation can only be saved by pouring water on the extraction pump gland.

The salinometer arrangement has some bearing on the problem. The original arrangement showed the salinometer fed from the feed tank side of the back pressure valve, and returning to a pig's ear high in the boiler room. On trials it was found that the pressure obtained would not cause a flow through this system. For that reason, the salinometer was then fed from the extraction pump side of the back pressure valve and the return led to the condenser. This is the present arrangement and it has the disadvantage of reducing the extraction pump discharge pressure.

It is unfortunate that the extraction pump gland is so inaccessible that to remove the packing necessitates the dismantling of the pump.

It is suggested that :—

(*a*) The extraction pump should be fitted with an air balance pipe to allow air which enters the pump casing to escape to the condenser (i.e. fit an arrangement similar to the main engine extraction pump system). This modification appears to be feasible.

(*b*) The extraction pump should be re-designed to facilitate removal of the old gland packing.

(*c*) The salinometer should be fed from the extraction pump side of the back pressure valve and the return led to the feed tank side of that valve through a non-return valve. Alternatively, the salinometer, which is not at present continually in use, could be removed.

(*d*) The gland sealing water should come from the feed tank side of the back pressure valve. The pressure available at this point will be equal to the head of water in the feed tank, and should be sufficient. The fitting of an internal pipe in the feed tank would ensure that the head remains constant at the highest possible level.

Comment

This matter is being investigated.

Emergency Closing Steam Valves—H.M.S. ' Hardy '

The starboard valve-closing gear has been out of order for some time, due to the existence of a steam leak, which necessitates a large amount of dismantling. The port valve has been tried regularly and on each occasion has failed to close beyond the $\frac{7}{8}$-shut mark.

Comment

The $\frac{7}{8}$th closing is noted and this will be cross-checked with others of the class in due course. Similar trouble occurred during the relatively early trials in *Hardy*, and sea valve discs with modified clearance between the mating annulus were fitted by Messrs. Hopkinson.

F.F.O. Pumps—H.M.S. ' Hardy '

Trials have been carried out with one pump air vessel blanked off. The discharge pressure on this pump drops about 100 lb/sq in at the end of each

stroke. This pressure drop causes a flicker in the flame which is just perceptible at low pump speeds. It does not appear to affect combustion at any power. It is considered that it would be practical to remove both these air vessels to make room for an extra feed pump.

The air vessel fitted to the other pump contains so much oil at 650 lb/sq in that it takes a long time to drop the oil pressure to 200 lb/sq in when manœuvring. This delay is particularly annoying when manœuvring on one boiler. It would appear therefore that there is no reason to retain these bottles.

Comment

This matter is being investigated.

Steam Leaks—H.M.S. ' Hardy '

The following paragraphs summarize the steam leaks which have occurred and for which no obvious explanation can be found :—

(*a*) *Permanite Joints.* Two spigotted joints on valve covers fitted on Weir's auxiliary turbine made with C.A.F. jointing. Two spigotted valve covers on the main boiler pressure gauge valves.

(*b*) *Spiral Wound Gaskets.* Steam inlet to port main circulator. Two joints on H.P. saturated steam line to port F.F.O. pump and heater. (Not yet investigated.)

(*c*) *Monel Joint Rings.* These joints have been very troublesome and about 24 have required re-making. Three types are fitted :—

(i) 1/32 in. rings fitted to spigotted covers on Yarway steam traps. Four discs have blown out.

(ii) 1/64 in. discs fitted between one plain and one serrated face in a screw-type joint for small bore piping. About six joints have blown out.

(iii) $\frac{1}{4}$ in. washers fitted between two serrated faces in a screw-type joint for small bore piping. At least twelve have blown out.

Results of Hardness Test

Type of Joint	*Probable Method of Annealing*	*Remarks*	*Brinell Numbers*
(*a*) Case-hardened steel washer	—	Sent for reference	241
(*b*) Mild steel nut	—	ditto	187
(*c*) Yarway steam trap joint ..	(ii)	Unused	223; 103
(*d*) Thin disc	(i)	Used	223 ; 217
(*e*) ,, washer	(i)	,,	225 ; 285
(*f*) ,, ...	(i)	,,	170
(*g*) ,, ...	(i)	,,	207
(*h*) ,, ...	Unannealed	Unused	207 ; 197

It has been noticed that the serrations on the faces are usually partially crushed. Six samples of joints were sent to the U.D.E. workshop at Portland for hardness tests. The results, tabulated above, indicated that all joint rings were harder than mild steel, and one exceeded the case-hardened reference piece. Various people have been asked about the method of annealing monel metal and three answers were obtained :—

(i) Heat to red heat and allow to cool, or quench

(ii) Heat the thin rings with a match

(iii) Heat to yellow heat in a carburizing atmosphere and allow to cool.

Comment

Ships can fill in the standard forms supplied to the Engineer Officer by E.-in-C. Department (Pipe and Valve Section), and use the points noted thereon as a basis for any other type of report made on valves and joints where applicable. Any further remarks upon the failure of the three spiral wound gaskets will be of value, particularly if the steam joints are found to fail again.

The report on monel joint rings is much appreciated and the matter be will raised with Messrs. Dewrance with regard to the Yarway traps. The trouble is well known but none the less irksome for this. A Brinell of about 110–130 is expected for fully annealed monel washers. Monel washers should be annealed as (iii) above, but in an oxidizing atmosphere (B.R.1988, Art.0432 also refers).

Monel metal washers have been superseded by special spiral wound gaskets in steel screw connections (Admiralty Pipework Standards, Table 30). These gaskets are to become *Rate Book* items but it is suggested that *Hardy* should put in a special demand for a gross of each of the three sizes as an ample first supply. The demand should be as follows :—

144 in No. spiral wound gaskets of each 3 sizes—Walker Type CSS/AJ/020

(*a*) 0·135 in. thick, $\frac{7}{8}$ in. O.D. $\frac{1}{2}$ in. bore
(*b*) 0·135 in. thick, 1 in. O.D. $\frac{5}{8}$ in. bore
(*c*) 0·135 in. thick, $1\frac{1}{8}$ in. O.D. $\frac{3}{4}$ in. bore

They may be fitted in lieu of existing monel joint rings both thick and thin but preferably, the serrations on the ends of the pipe fittings should be filed or machined off. Care should be taken to re-align pipes as necessary to give good alignment of the pipe ends at the same time that the S.W.G.s are fitted. Cold resetting is satisfactory for the degree of bending likely to be involved.

Spare Gear—Third Training Squadron

Although the official allowance of spare gear has not yet been received, it is believed that spare blow-down and running-down valves for main boilers are not allowed by establishment. Refitting these valves is not an easy job, and it is suggested that a spare valve of each type should allowed.

There is no allowance of spare joints for the coils of Weir's evaporators. The drawing indicates that these are 1/32 in. C.A.F. rings, 112 rings per set. The *Rate Book* lists joint rings for Weir's evaporators (E2.(d). Pattern No. 240 and 241) but neither of these sizes are suitable. Information is requested on the procedure necessary to obtain these rings and it is suggested that an allowance should be included in the spare gear list.

Comment

It is confirmed that no spare blow-down or running-down valves are allowed. The maintenance schedules lay down that these valves are to be refitted every

18 months and it was therefore considered unnecessary to carry spares against an unforeseen failure. If it has been found necessary to refit these valves more frequently, the matter should be reported to the Class Authority to enable provision of spares to be reassessed.

Action is being taken to ensure that C.A.F. joint rings for evaporator coils are provided by D. of S. and it is intended to add these items to the *Rate Book* in due course. Until items have been patternized, they should be demanded through S.N.S.O. quoting full particulars of items from relevant drawings.

Technical Publications—Third Training Squadron

More information about the new types of boilers and machinery being fitted in new construction ships would be appreciated and would lessen the shock to engineer officers and ratings when appointed to these ships.

' Notes from Sea ' is a very popular article in the *Journal of Naval Engineering* and, it is felt, could be made longer.

There is a need for an up-to-date and attractive book for junior engineering ratings produced on the lines of the *Junior T.A.S. Manual.* It is hoped that the new *Machinery Manual* may fill this requirement.

Comment

Most of the handbooks for *Whitby* and *Blackwood* Class frigate propulsion machinery have now been published in the B.R.'s 2111, 2112 and 2113 Series. These and future handbooks on new construction machinery are announced in A.F.O.s (Section 5) on distribution ; if ships, other than those immediately concerned, wish to demand copies, the demands will be met as far as stocks of the books permit.

It is hoped that the new *Machinery Manual* will be found to serve its purpose as adequately as the *Junior T.A.S. Manual.* Owing to a series of delays, its publication cannot be expected for a further eight months.

The Editor is gratified that ' Notes from Sea ' prove of such interest and value, but he must point out that their number is entirely dependent upon the material sent in from sea. He would point out, also, that, though the majority of marine engineering items are obtained from Periodical Letters, there is no reason why others should not be submitted direct to him for inclusion.

Hull and Fire Pumps—H.M.S. ' Vigo '

The three 40-ton Worthington-Simpson hull and fire pumps do a great deal of running. With the long haul required for any of these pumps to remove boiler-room bilge water, it is vital that the pumps pull 25 in. vacuum without any bother. It is well known that, with rotary air pumps, a small amount of wear drastically reduces pump efficiency and the reduction of running-time is therefore pertinent. One way of meeting this problem would be to arrange for pumps to be stopped during the night (for, say, 9 hours), when the immediate needs of the firemain could be met by the provision of a small 5-ton pump working in conjunction with a 100-gallon air-loaded accumulator, similar to the Pneupress fresh water tanks fitted in the ship. In the event of a fire, hull and fire pumps would be run up before the accumulator was exhausted.

Comment by S.E.O.

The provision of a small sanitary pump to relieve the hull and fire pumps, particularly at night when the off-take from the firemain is small, is strongly supported. A similar suggestion raised by *Vigo* as a proposed Alteration and

Addition (Lettered ' HA ') in November, 1955, was turned down by the Admiralty, though, to reduce noise on the messdeck, ships officers were instructed to select an alternative site in Nos. 1 or 2 boiler rooms for one pump. Such a rearrangement would in no way reduce the overall wear and tear on the hull and fire pumps in general and would tend to increase the use of the re-sited pump in particular.

Comment

This matter is being considered by D.N.C.

English Electric Diesel Generators Type 6.H.—H.M.S. ' Vigo '

Some confusion exists over the correct tappet clearance of inlet and exhaust valves. The maker's handbook shows this as 0·006 in. at valves (both inlet and exhaust) on the push rod side of the machine and 0·008 in. at valves (both inlet and exhaust) on the exhaust side of the machine. A.F.O. 1408/54, however, gives 0·006 in. for inlet valves and 0·008 in. for exhaust valves. The difference is small, but may contribute to the better running of these machines, and information on this point would be much appreciated.

Comment

The instructions contained in the maker's handbook are correct. It is appreciated that A.F.O. 1408/54, para. 2, is misleading, and it will be amended.

Stern Glands—H.M.S. ' Starling '

A heavy consumption of lubricating oil (mixture : equal parts O.C. 160 and O.M. 750) has been experienced for a considerable time. This was approximately 0·68 gallons per hour when under continuous steaming conditions. The operational range of the ship is thus determined, not by the amount of F.F.O. carried, but by the number of 40-gallon drums of these oils that can be stowed on the upper deck.

A failure of the pipe leading back to the lubricating oil tank from the port ' A ' bracket necessitated an emergency docking. A closer inspection of both tubes and ' A ' bracket bearings thus became possible.

While in dockyard, it became obvious that there were many diverging views on the efficacy of United States packed glands and bearings. Some experienced people went so far as to say that lubricating oil was, in fact, not necessary and ships of the class had run for long periods without any oil. A view that seemed authentic when the dockyard produced a wear down reading of the port ' A ' bracket which was 0·005 in. up on the previous reading and this, after having run for 8 hours on a mixture of sea water and compound oils.

It would be considered advantageous if the following information could be obtained from other ships fitted with these tubes and bearings :—

(*a*) The most suitable mixture of oils to be used

(*b*) The estimated upper limit of consumption of these lubricating oils.

Comment

Possible causes of the heavy consumption of lubricating oil are:—

(i) Abnormal vibration of the propeller shafts, causing the fixed components of the gland packing to loosen.

(ii) Weakness in the compression springs, which provide the sealing compression between the forward and after wearing rings in the glands.

(iii) Incorrect adjustment of the rotating clamp.

Similar heavy oil consumption was reported from the C.M.S.s when using a mixture of O.C.160 and O.M.750 (50/50). These ships were fitted with Vickers glands. As a result, it was decided to use a proprietary emulsifying oil known as Vickers Neox RS (A.F.O. 1824/56 refers), and it is understood that the trouble has been overcome. If similar troubles to those experienced in *Starling* are reported by other ships of the Class, fitted with the same type of gland, then consideration would be given to using Vickers Neox RS as the lubricating oil. This oil is expensive, and before consideration can be given to its use, the Admiralty oil must be proved unsatisfactory.

In the next periodical letter it would be appreciated if the results of the examination of the forthcoming refit could be included, together with any information from *Redpole* (fitted with the same type of gland) in connection with (*a*) and (*b*) of the report.

Paxman 4 RQ Diesel Generators—H.M.S. ' Rampart '

It was observed that two generators were fitted with C.A.V. fuel pumps, type BPE4B65Q300/3S69 and two were fitted with C.A.V., type BPE4B65Q 300/3S679. After obtaining an up-to-date handbook for the 4RQ engine, it was found that the type BPE4B65Q300/3S69 was designed for an engine with a fuel injection point of 27·5 degrees B.T.D.C. while the pump type BPE4B65Q 300/3S679 was a later modified model with a quick lift camshaft. Using this pump, the designed fuel injection point is 23 degrees B.T.D.C.

Nos. 3 and 4 D.G.s are later models than Nos. 1 and 2 and were originally fitted with the 23 degree B.T.D.C. pump. When these became defective, the new pumps obtained from the S.P.D.C. were of the older design as no stocks of the new design were held. These were fitted to Nos. 3 and 4 D.G.s and, through lack of information, an error of 4·5 degrees in the fuel injection point was created. The consequent incorrect firing was a large factor in the history of defects of these engines.

All C.A.V. pump numbers and data concerning injection points, etc., have now been confirmed by letter from Messrs. Paxman. The sub-S.P.D.C. (Clyde) is now aware of the difference in pumps and are adjusting stocks accordingly. The two engines which originally had the modified pumps were adjusted to an injection point of 27·5 degrees and satisfactory results were obtained with emphasis on easier starting.

Comment by S.E.O.

The above stresses the need for supplying as much information as possible on Forms S.134 when demanding spares and, in particular, the importance of quoting engine serial numbers.

Comment

Fuel pump type BPE4B65Q300/3S69 is fitted to engines prior to No. 3378 ; fuel pump type BPE4B65Q300/3S579 to engine No. 3378 and to subsequent engines.

The comment by S.E.O. is fully endorsed.

Oil Changes for Paxman 4 RQ Engines—H.M.S. ' Rampart '

Form S.1195 for Paxman 4 RQ engines gives the hours for complete oil change as 150 and repeats that the 500-hour routine demands a complete oil change. Investigation shows that, at 150 hours, the oil is still in good condition

and it appears wasteful to change it at that time. The Autoclean filters are cleaned every 50 hours, Paxman recommend 500 hours.

Comment

The oil should be changed after the first 150-hours running, and then at each subsequent 500-hour routine. The ambiguity in Form S.1195 will be removed when the form is reprinted.

ORDNANCE ENGINEERING

Comments by D.N.O.

4·5 in. Mark 2+++ Mounting Hydraulic Leaks—H.M.S. ' Ark Royal '

It has been found extremely difficult to prevent oil leaking past the flat copper joint rings in training and elevation ' three-way ' valves. The main difficulty has been that the bottom pipe connection is designed to perform three duties :—

(i) To locate the outer ball-race on the body of the valve

(ii) To make, with the copper joint ring, an oil-tight seal

(iii) To act as a connection between the main body of the valve and the pipe flange.

When conditions (i) and (iii) are met, there is not necessarily sufficient ' squeeze ' on the joint ring to effect an efficient oil seal. Placing shims under the joint rings to increase the ' squeeze ' has decreased the leakage, but not eliminated it ; the fitting of thicker copper joint rings would have a similar effect.

It is considered that better results would be achieved by separating the functions of the bottom pipe connection. This could be done by locating the bearing by a separate screwed ring, cutting back the pipe connection to give clearance, and fitting an ' O ' seal in place of the copper joint ring.

Comment

Approval for the fitting of an ' O ' seal in place of the flat copper joint ring has been given. Oil leakage at this joint has been noted on 4·5 in. Mk. 4 mountings, in which the same valve design is incorporated, and ' O ' seals have been fitted successfully. Modification to the ball-race retaining arrangement should not be necessary.

4 in. Mark 19 Recoil System—H.M.S. ' Newcastle '

The counterbalance rods and breech-block yoke of two guns were found to be bent after slip testing. The run-out of the guns during testing was observed to be excessively fierce. Venting the recoil cylinders during and after filling had been carefully carried out but, on venting after the test, air was found in the main cylinder. The cylinder was finally cleared of air pockets by hauling the gun back and easing it out several times, venting each time in the run-out position. As the amount of air found decreased after each hauling back, the possibility of air being drawn into the recoil cylinder during hauling back can be discounted.

It appears that the only way of overcoming this difficulty is to haul back, ease and vent several times whenever the recoil cylinder has been emptied and refilled, in addition to the normal practice of moving the guns in elevation.

Comment

The advisability of hauling back, easing out and venting whenever a recoil cylinder has been emptied and refilled is being investigated.

Even if a recoil cylinder is fully vented before firing, sufficient air could enter, through a defective piston rod gland seal in the first few rounds, to cause excessive run-out speeds with subsequent rounds. When run-out speeds appear excessive the piston rod and gland seals should be examined at the earliest opportunity ; any scoring of the piston rod should be smoothed by light stoning, and gland seals renewed irrespective of their apparent condition.

6 in. Mark 25 Hydraulic Motor—H.M.S. ' Newfoundland '

On two occasions recently the hydraulic motors for elevating the guns have had to be replaced. In each case the motors, which are of the Barrow type gunmetal casting with cast steel end-plates, have failed because the end-plates, carrying the supply and exhaust pipes, have cracked. In one case a crack 3 in. long had developed, while, in the other, the casting was cracked right across, through one of the pressure pipe flanges.

The only suggestion that can be offered to account for these failures, apart from inherent weakness in the metal, is that there was air in the system and that this caused the equivalent of water-hammer in the engine. This may have given rise to sufficiently high local pressures to create the damage. Although there was no evidence of air in the systems before the damage occurred, the elevation motors are at the highest points in the pressure system.

Comment

It is possible that these failures may have been due to excessive vibration or misalignment of the supply and exhaust pipes carried by the end-plates. Care should always be taken that hydraulic pipes are properly aligned and adequately supported, particularly where they are connected to a rigid assembly.

40 mm. Mk. 5 Mounting Mechanical Drive—H.M.S. ' Lock Insh '

During routine running of the mounting a knocking was heard in the elevation drives. Before the mounting could be stopped the elevation motor stalled, and was found on investigation to be jammed. It was found that the set-screw securing the retaining nut for the outer casing of the power drive friction disc coupling had worked loose and was fouling the main framework. When the set-screw was tightened it was found that only a ten thousandth feeler could pass between the screw and the frame. The frame has been cut away on a reasonably wide diameter to avoid jamming, but the hole was approximately $\frac{5}{8}$ in. off centre from the main drive shaft.

Comment

According to manufacturers drawings the clearance between the head of the set-screw and the platform frame should be about 0·85 in. compared with 0·01 in. reported. A gross positional error must therefore exist in this particular mounting. It is intended to modify all mountings by fitting a ' Shakeproof ' type washer under the set-screw head to prevent it slacking back.

C.R.B.F.D. Training Stop—H.M.S. ' Roebuck '

The director jammed in training during routine running, coming to a stop with a violent shudder. A sheared brass bolt was found under the director.

The cover plate of the training cut-off valve and the deck plate covering the stop lever were lifted, and the training stop lever was found to have dropped and had fouled the base ring and various plate-securing bolt heads. This had occurred because the countersunk screws securing the stop lever assembly to the brackets had sheared, and the lower retaining plate had fallen off. The training cut-offs were found to be operating correctly and it is not known what caused the original shearing of the securing screws ; the shears appeared to be old.

Comment

The damage to the mechanical stop gear is probably due to failure, at some time, of the hydraulic stop gear. This has previously been investigated and could have been due to several causes, e.g. :—

(*a*) Bent or damaged tappet rods
(*b*) Incorrect setting of the cut-off valve
(*c*) Seizure of the plunger
(*d*) Incorrect setting of the relief valves in the training motor, causing failure to respond to the cut-off valve at high rates.

C.R.B.F.D. Convergence Mechanism—H.M.S. ' Ursa '

During investigation of errors found during a test of the convergence mechanism, it was discovered that as soon as the main oil pump was run, the lateral gun deflection platform in the dome analyser moved to one limit of its movement and was locked there. This suggested that the valve and valve liner of the servo control for the separation distance setting ram were not operating correctly. On inspection it was found that the valve was siezed in the liner. The items were removed and washed in white spirit and then soaked in oil. On reassembly there was no stiffness between them. The trouble is thought to be due to the entry of foreign matter between the valve and liner.

Comment

Trouble of this nature has been experienced in the past, due to an hydraulic lock occurring between the liner and the valve body. A modification has been introduced to overcome it by providing grooves in the valve body.

In this case it is probable that foreign matter was the cause of the failure and a modification has been issued to incorporate a filter in the main oil system.

It has been found in certain cases that sticking of the separation valve can be cleared by setting maximum separation and running the range drive between top and bottom limits.

Demands for Ordnance Spare Gear

Some ships persistently demand items which are not catalogued as Spare Gear.

Comment

Headquarters does its best to satisfy such demands when the case is known to be a deserving one, even to the extent of cannibalizing complete spare equipments held in store as Contingency Reserves and arranging contract action to replace the item demanded. But ships' officers should stick to the rules and only employ S.134 action for items which are actually catalogued in B.R.226. Items not listed there should, of course, be obtained by Defect List action or, in an emergency, by signal, and covered later by D.L.

HOME FLEET ENGINEERING MEETING

At a meeting of the Engineer Officers of the Home Fleet held in Gibraltar in February, 1957, the Fleet Engineer Officer said that he wished to express some strong views on various subjects which he had acquired during the two years of his appointment. The following notes embody those views and the points raised in the discussion that took place.

Burning of Fuel Oil

If fuel was burned correctly with clean, properly aligned sprayers and correct temperatures and pressures, no smoke would be made, there would be few brickwork troubles, and boilers would generally not suffer breakdown. If fuel was burned incorrectly trouble was bound to occur. F.E.O. was not satisfied that this received enough attention. He instanced the practice of ratings speeding up the fans to eliminate smoke caused, in fact, by other combustion conditions being incorrect. All engineer officers should ask themselves, ' Can we avoid bad combustion? '

One very important point was boiler casing leakage. An H.T.O. had been published on the subject. It was not sufficiently realized that casings did leak, and that leakage had a very bad effect on combustion, especially by short-circuiting the air intended for the sprayers. Leaking also necessitated increased fan speeds, with considerable wastage of power. All engineer officers were urged to borrow the velometers held in the Flagship—they would find remarkable results.

The E.O., *Apollo*, said the velometer had shown the extent of unsuspected leakage and had enabled him to persuade the dockyard to stop the leaks. Fan speeds had dropped from 1,800 to 1,500 r.p.m. and, at the last full power trial, the boilers had produced, for the first time, more steam than the engines could take.

The Squadron E.O., 6th F.S., stated that the boiler casings in *Undine* had been sealed and, though no full power trial had been carried out, fan receiver pressures had dropped considerably and one fan could be used where two had previously been necessary.

There was general agreement with the suggestion that a new form of fastening was needed.

Tank Cleaning Vessels

The F.E.O. encouraged the maximum use of these vessels, which were available at Home Ports. New ones would be fitted for water washing boilers. Present T.C.V.s could be used for this purpose, but dockyards have difficulty in disposing of soot. The Chief Engineer, Gibraltar, said there was no T.C.V. at Gibraltar, because its utilization would not justify it.

Refits

Ships are often left in a very dirty condition at the end of a refit, necessitating a lot of work by ships staff to clean them. M.E.D., Portsmouth, had stated that each gang had labourers whose job it was to clean up and ships officers should see that this was done. Dockyards would not clean up dirt created by ships staff, however.

During refit periods, or at other times when dockyard assistance was being given, ships staffs must do their share of the work. Dockyards could not be

expected to work longer hours than ships staffs. Engineer officers must keep a careful eye on the progress of dockyard work, and encourage officers of other branches to do so as well, so that any complaints or suggestions could be made in good time.

A Home Fleet Order has been issued which allowed to the Engineering Department a one-week working-up period in the post-refit programmes. Ships had often left refitting yards after re-commissioning, with inexperienced engineer officers and ratings, under great difficulties and sometimes with almost disastrous results. In the past they had usually ' got by ' and the Department been taken for granted, but under present conditions this working-up period must be insisted upon and put to the best possible use. Each watch should be exercised in lighting up and shutting down, failures of all kinds being exercised. It was essential that all watchkeepers knew exactly what to do in an emergency and knew the implications of gauge readings.

Gas-Tightness

Closing-down trials invariably reveal some compartments which are not gas-tight and there is a tendency to neglect the air-tightness of the ship as a whole. In this Atomic Age, air-tightness is of extreme importance but there seem to be no regulations governing air pressure tests of compartments other than W.T.C.s, nor any statement that such tests were compulsory after dockyard work. The E.O.s of ships should draw the attention of dockyards to the need for air tests after work has been carried out.

The Chief Engineer, Gibraltar, said that dockyards would co-operate in this.

Hulls

Three ships were leaking through split plates below the waterline. This well known defect was due to corrosion fatigue, brought on mainly by panting of plates. He urged all officers to look out for panting plates, especially where frames were widely spaced. Where panting was known to occur, dockyards should be asked to stiffen or renew plates.

Water Washing Boilers

In certain cases, steam washing could be more effective than water washing for external cleaning. There was a recent example of steam washing being effective in cleaning an economizer, where water washing had failed. The method had been used with success in some *Darings* and Engineer Officers were advised to consider its use, particularly for economizers and superheaters.

Defect Lists

Supplementary defect lists were a necessary evil, but should ideally be limited to items which could not have been foreseen when the main defect list was written. The main defect list should therefore be very comprehensive, and this would greatly assist dockyard planning. The Fleet Engineer Officer reminded officers of the need for comprehensive trials of machinery (including full power trials) before the main defect list was written.

The Chief Engineer, Gibraltar, endorsed the F.E.O.'s remarks, pointing out that a comprehensive main defect list was essential for the timely procurement of materials, accurate work-planning and labour allocation. The defect list should be as detailed as possible.

Unprogrammed Work

The F.E.O. pointed out that Q.R. and A.I. laid down that dockyards must not be asked for assistance at 'un-programmed' periods, except in the case of defects which affected seagoing or fighting efficiency, merely because the ship happened to be in a yard. There was also an H.F.O. to the same effect. In the past, home yards had often refused to do such work but, more recently, he had found M.E.D.s were sympathetic when they realized that the work was really necessary. Planned maintenance often needed dockyard assistance.

The position is now recognized at all levels, and yards had been allocated money specially to provide assistance for Home Fleet ships whenever needed and possible. Q.R. and A.I. was unlikely to be amended but, if D. of D. agreed H.F.O.1000 would be amended to show what yards could be expected to do at un-programmed times. The maximum notice must be given to yards if their assistance is required and it must only be sought if the ships staff is working to full capacity.

Hull Maintenance

The principles of planned maintenance were well known, but the need for hull maintenance, in its broadest sense, was not so well appreciated. One ship had allocated sections of the ship to individual men who were responsible for all hull structure and fittings in their area. This had been most successful. Draft hull maintenance schedules had been distributed to ships, and more could be provided if necessary. Some graphical method should be devised to show the progress of hull maintenance and inspections. Ships which do this have shown immediate improvement.

Personnel

Newly Trained Ratings

Nearly all ratings left their training establishments very keen, but their interest was apt to flag after a short time at sea, and they often left the Service after a short engagement. This was a difficult problem, but E.O.s should do their utmost to keep up the enthusiasm of junior ratings.

Corsham

The F.E.O. encouraged all engineer officers to visit the Petty Officers' School and emphasized that the greatest use should be made of the new abilities that the petty officers acquired during the course. They should be given as much responsibility as their experience and training would allow. This view was endorsed by the C.E., Gibraltar, who recommended that all officers should read reports from the school.