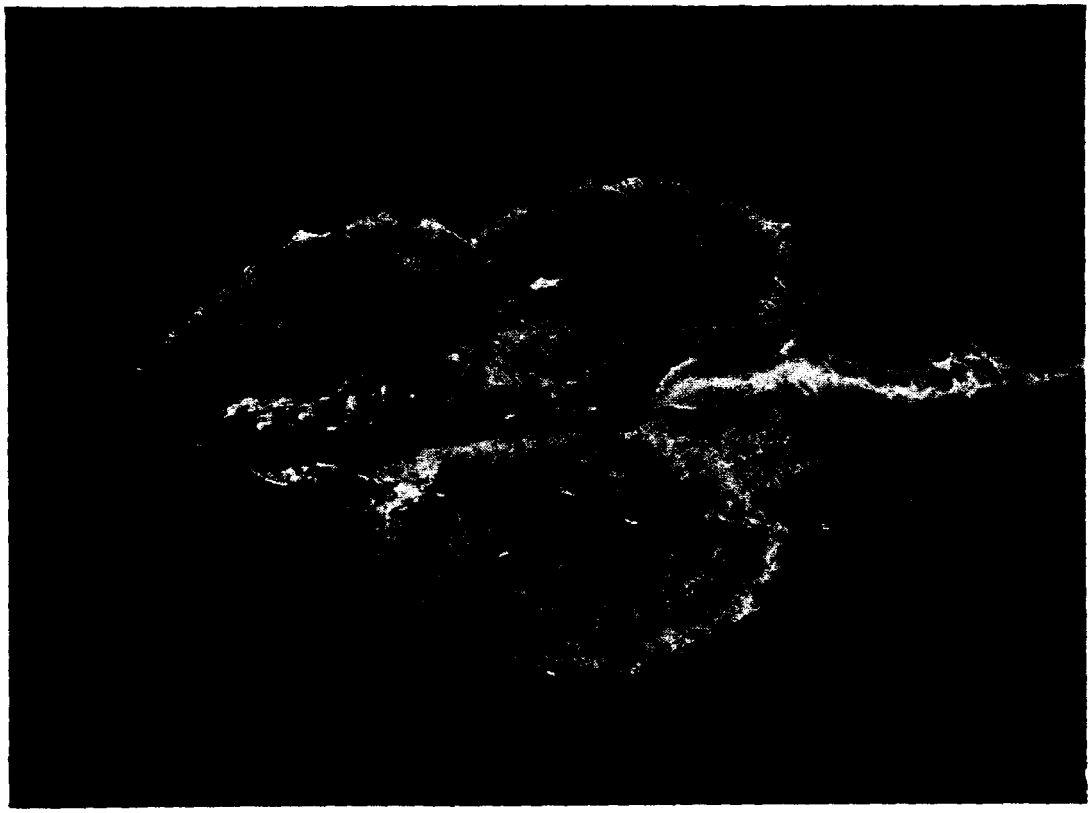

Death to the Submarine

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.

Boilers—H.M.S. ' Ocean '

During the quarterly full power trial it was clear that the forcing rate of the boilers was only 86 per cent of the maximum allowed so a trial was carried out with two after boilers connected in which the authorized maximum forcing rate of 46·3 lb/hr/sq ft of T.W.A. was achieved. Under these conditions, the mean r.p.m. was 160 and a speed of 18 knots was logged, which, allowing for the state of the ship (ten months out of dock), agrees with the performance curves.

The torsionmeter readings, which have long been suspect in *Ocean*, and so reported, do not agree with the curves. This trial, however, suggests that they are reading anything up to 4,000 s.h.p. high ; referring back to the full power trial this means that the s.h.p. developed was only of the order of 39,000, which is more consistent with the contractors trial results in relation to the r.p.m. and speed achieved at this trial. It is the intention to ignore the torsion-

meters during the next full power trial, and gauge the engine power by (*a*) the temperature at the full power by-pass, which should not exceed about 650 degrees F. and (*b*) the percentage of maximum forcing rate at the boilers, which is not likely to be more than 90 per cent. It would be interesting to know what figure was used in the design of the boilers ' spare ' for the auxiliaries at full power ; otherwise, in default of reliable torsionmeters, and bearing in mind the average inaccuracy of both pressure gauges and high-temperature thermometers, it is difficult to see how this factor can be fairly assessed.

The largest proportion of man-hours expended on the boilers and associated fittings was undoubtedly on the refit of air cocks, gauge glass mountings and superheater header drains. New gauge-glass mountings have been obtained and are being fitted progressively. It is realized from correspondence from other ships reported in the *Journal* that this matter is in hand for new construction ; nevertheless, any engineer officer who failed to take what opportunity he had of reporting these defects would be letting down his maintenance team, so disproportionate is the effort required by them. The only time *Ocean* has failed to be made ready for sea in 20 months was due to a drain cock blow-out.

Comment

The only limitations which have been laid down regarding steaming conditions are :—

(*a*) Maximum forcing rate not to exceed 48·7 lb/hr/sq ft of T.W.A., based on a T.W.A. of 201·2 sq ft

(*b*) Maximum output of saturated steam from boilers not to exceed 7,500 lb/hr

(*c*) The contractors trial figures of shaft speed, h.p. and turbine 1st stage pressure at full power not to be exceeded.

No limitation of temperature at the F.P. by-pass valve has been stipulated—letters received by E.-in-C. from *Ocean* gave the impression that 650 degrees F. was the maximum temperature ever likely to be achieved in any circumstances. No reason is seen why this figure should not be exceeded, provided a reasonable pressure drop is maintained through the 1st stages of the turbine in order to cool this stage when the by-pass valve is open.

Arrangements should be made through the dockyard for the torsionmeters to be checked and re-calibrated as necessary by Messrs. Siemens at the next docking period.

Klinger sleeve packed steel gauge-cocks incorporating a stainless steel portion carrying the gland nut threads have recently been accepted for supply as *Rate Book* articles against Patt. Nos. 209–210B series. Air cocks and superheater drains will give better service if replaced by S.D. forged steel valves—Patt. Nos. 10040 ($\frac{3}{8}$ in.), 10037 ($\frac{1}{2}$ in.), 10038 ($\frac{3}{4}$ in.) and 10039 (1 in.) are suitable. There are likely to be heavy demands for these newly-introduced valves however, and the supply position from naval stores will probably be difficult until later in 1958.

Lubricating Oil Separator—H.M.S. ' Ocean '

An accident which might have had serious consequences occurred to the oil heater associated with the lubricating oil separator in No. 4 Diesel generator room. On shutting down, the watchkeeper switched on the second heater, instead of switching off the first. The resulting overheating was sufficient to cause an explosion, similar to a crankcase explosion, which burst the tank

and filled the room with lubricating oil mist. This, fortunately, did not ignite and so no other damage was done.

The relief valve was carefully tested and examined, and found to be correct ; the rise in pressure in the tank must have been instantaneous since no oil was found in the relief valve waste pipe.

Arrangements have been made to interlock the separator starter switch with the heaters, so that the heater cannot be switched on unless the separator is running.

Comment

Confirmation is requested that two heaters are in fact fitted. According to the information available, *Colossus* Class carriers were originally provided with one lubricating oil heater to each Diesel generator compartment. It would also be of assistance if a wiring diagram of the interlocking arrangements could be forwarded so that the electrical aspect can be investigated further.

Boats—H.M.S. ' Ocean '

Perkins valve springs are giving as much trouble as ever. Propeller shaft coupling securing nuts have slacked off twice and allowed the shaft to start walking out through the stern gland. There is little room for any locking device and the only one tried, a screw and slot in the nut, has not succeeded.

Water cooled silencers have finally been discarded altogether after repeated failures. Boats have run quite well and safely without them and there has been no complaint about any increase in the noise.

P6M(O) engine control is excellent. However, the engines are received with oil leaks which are not noticed until after the engines are installed. By this time, some of them are difficult to locate. One engine also was received with aluminium filings in the gearbox and a faulty pump.

However satisfactory the maintenance and repair statistics compiled from Fleet Returns may appear at headquarters, it must be emphasized that, with the high usage rate of the boats in *Ocean*, there is little confidence felt in the reliability of the engines. This opinion, although occasionally ill-informed, is based on fact, and does no good to the Engineering Department itself, nor to the Branch as a whole. Although improvements have, no doubt, been made over the last few years, it is considered that the percentage reliability of these engines is far from satisfactory on some components.

A recurrent defect when the usage rate of the boats was particularly high, occurred on the Perkins P6M engines. A banded rubber sleeve on the lubricating oil pump drive failed easily when contaminated by oil ; a brass flexible claw coupling was fitted in lieu by ships staff and has proved most satisfactory.

Comment

P6M engines in service are in most cases over 15 years old and the design even older. Because large stocks existed in service from the war, no new models of the type have been purchased but these have been modified, by Wouldhams, as far as possible on each occasion of major overhaul. The most recent modification (conversion to P6M(O)) incorporates a large proportion of components of the latest design and should be an improvement on the P6M(M) type, apart from the gearbox, which is completely different.

Such matters as oil leaks, etc., are due entirely to the standard of workmanship at the overhaul depot.

The remarks on the failure of the lubricating oil pump drive are not understood as our information is that the drive is by tongued and grooved rods and

does not incorporate a rubber sleeve. Further information on this defect and on the modifications carried out would be welcomed.

Fire Fighting and Damage Control—H.M.S. ' Ocean '

An unexpected flood occurred when leaving Antwerp which is of sufficient interest to record. Due to underwater damage, No. 2 Ballast Tank was found to be leaking slowly from the sea ; it was the intention to leave it to fill and during the night this occurred, but a joint on the air-escape pipe a few feet below the water-line had failed, so the pump compartment, through which this pipe passed, slowly flooded and, because the clips were not fully home on the small-arms magazine door, further flooding also occurred there. The importance of establishing and patrolling a damaged area flooding boundary was amply demonstrated, as was the fact that in damage control it is often the overlooked detail which sinks the ship.

Boilers—First Destroyer Squadron

(*a*) The small sump fitted in the floor of one boiler in each of *Chieftain* and *Chaplet*, has proved of great value when waterwashing. It is believed that this has already been the subject of a proposed A. and A. from *Comet*, and it is hoped the idea will soon be approved for all ships. The original design could be improved by fitting a suction from the bottom of the sump and extended to an accessible position in the boiler room.

(*b*) The boiler casings fitted in these old ships are a continual trial and the cotters are a nuisance. The casings could be more positively secured by studs and nuts, or by butterfly nuts. A velometer has been used by all three ships and has been most useful in indicating which casings require repair or replacement during the forthcoming refits.

Comment

(*a*) A proposed A. and A. should be accompanied by sketches showing the modifications to the furnace floor and the arrangement of brickwork in the existing sumps.

(*b*) This will be investigated. The value of the velometer is noted with appreciation.

General Service Commission—First Destroyer Squadron

It is only during the last six months of this commission that the three ships have managed to achieve any real unity. Before that they were often operating independently, or were refitting.

There is no doubt that a refit during a commission achieves a better refit, but it is still unfortunate that it breaks up the commission disastrously and necessitates another, almost complete, work up, with loss of operational time and effective naval strength.

The operational boys do not like refits, while the purple blooded engineer likes nothing else. There must be a mean between the two and with the present shortage of ships and men I believe the mean to lie where the refit will least interfere with the commission.

Comment

Where opinions differ, not only between specializations but between individual officers of the same specialization, it is agreed that the answer must be a

compromise. There are Admiralty committees, on which E.-in-C. is represented, currently considering the operating cycles for both projected and existing ships, but the knitting of such cycles to the G.S.C. largely depends on advice from the Fleet.

General—First Destroyer Squadron

The main problems in these ships are accommodation and washing facilities, which in some respects are sub-human by present standards. For example, there is only one shower forward for the use of 120 men. There are no apparent intentions to improve these matters sufficiently, and in fact they could not be improved much without reducing the operational requirement below that of a Fleet Destroyer, for example, by permanently removing ' Y ' gun, the after magazine and the torpedo tubes, and re-allocating the space thus made available.

Comment

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

Condensers—H.M.S. ' Loch Insh '

Condenseritis has been experienced on three occasions since commissioning. It was found on the first two occasions that the joint between the stay bolt ferrule and after tube plate had failed. Difficulty was experienced in re-making this joint as the two flats cut on the ferrule collar reduces the jointing width at that point, to $\frac{1}{8}$ in. It is suggested that the thickness of the ferrule collar could be increased from $\frac{3}{8}$ in. to $\frac{1}{2}$ in., thus retaining the same depth of the flats and allowing maximum jointing area of the collar.

The third case of condenseritis is thought to be a failure of a tube at the inlet end of the second flow, as tightening of the ferrules did not reduce the contamination. Operational requirements plus the lack of condenser slinging arrangements did not allow the tube to be removed and the tube was plugged. The new condenser testing gear was used to good effect during this latter case.

Comment by A.O., Colombo

While the difficulty experienced in making an effective joint at the stay bolt ferrule has not been reported before, the suggestion that the thickness of the ferrule collar be increased from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. appears reasonable and practical.

Comment

The points raised were the subject of C.-in-C. East Indies letter No. 164/El.2032 dated 26th March, 1957, and a subsequent reply was made in A.L. D.7139/57 dated 25th June, 1957.

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

These have been in continuous use and have been satisfactory in operation, requiring little maintenance other than on the cooling water side. A recent spate of pin hole leaks would indicate that the life of the piping is nearing its end and an item has been entered in the defect list to have all inaccessible piping surveyed.

The implementing of the A. and A. to resite all compressor units inside the ship has resulted in some units being inaccessible for the purpose of mechanical

maintenance. In order to renew the gland seal in the unit supplying the ward-room, much of the electrical gear and casing framework would have to be removed in order to remove the compressor. It is appreciated that space within the ship is at a premium, but it is suggested that the four units to be fitted, *vide* A.s and A.s Nos. 412, 413 and 415, should be installed where both mechanical and electrical maintenance may be carried out with the minimum of inconvenience.

One of the difficulties incurred when fitting the Type ' A ' units inside the ship, is that of siting the compressor and expansion valve near its associate evaporator grids. It was considered by the Refrigeration Department of Devonport Dockyard that, to achieve efficient cooling, the maximum length of piping between the expansion valve and the evaporator grids, should be 30 feet. When the unit supplying the upper seamen's messdeck was resited, this distance was increased to 60 feet, with a consequent fall-off of cooling efficiency. An experiment to by-pass the existing expansion valve and fit a hand controlled expansion valve in the gas piping near the cooling grids was carried out, with a resultant drop of 2 degrees F. in the messdeck temperature. As the messdeck was open to continuous traffic, it is thought that in an enclosed space this temperature drop would have been appreciably more. An item to again resite this compressor unit has been entered in the defect list.

It has been found that the ' Tilley ' gas leak detector, Patt. B9/9789, is more sensitive than the older type ' Hallide ' detector, but its life is limited because the vaporizer becomes carbonized. Unlike the ' Primus ' stove, it is impossible to clear the chokage, the manufacturers stating that it is easier to fit a new vaporizer. The vaporizers are not a Naval Store item and at present, when they become carbonized, a complete new lamp is required. A letter has been raised proposing that these vaporizers be included in the *Rate Book* and classified as consumable.

Comment by A.O., Colombo

(1) Engineer officers of ships refitting should ensure that units, whilst generally in accordance with the drawing, are so sited that accessibility for maintenance is assured. The difficulty of ensuring this in the limited space available is appreciated but every effort should be made to ' make the best of a bad job '.

(2) It is recommended that vaporizers of the ' Tilley ' gas leak detectors be made consumable stores and listed in the *Rate Book*.

Comment by F.E.O.

Best use cannot be made of the space available so long as packaged units are always installed as such. Accessibility could be achieved by resiting certain components and it is considered that this should be resorted to when the engineer officer supervising the installation considers such a course to be desirable.

Comment

The ' packaged unit ' is intended only to make up for the lack of a main plant. It is appreciated that the units are not in every case the best shape for the compartment in which it is used. No objections are seen to the components being resited provided full details are supplied to the E.-in-C. department.

Diesel Generator—H.M.S. ' Loch Insh '

This machine has given excellent service and, regarding its performance, no adverse criticism can be applied.

A prolonged sandstorm during the ' Shamal ' season at Abadan, resulted in the engine air supply filter, sited on the upper deck, becoming rapidly choked. The vacuum caused by the engine was sufficient to collapse the air supply trunking and it is suggested that a ' re-circulation ' flap fitted to the trunking inside the ship could be used to advantage, a plate type air filter being quite sufficient to deal with the small amount of sand that would find its way into the ship.

Comment by A.O., Colombo

The necessity of ensuring a clean air supply to the engine during a prolonged sandstorm is appreciated. The suggestion that a ' re-circulation ' flap be fitted to the trunking inside the ship is not clear. If it is meant that the engine should draw its air directly from the machinery space then the suggestion is concurred in, but an air silencer/filter would have to be fitted.

Comment

No objection is seen to this suggestion provided that the ' re-circulation ' arrangements can be made gas tight for A.B.C.D. purposes.

Reciprocating Pumps—H.M.S. ' Loch Insh '

Using the Patt. E2/7400 series asbestos gland packing, difficulty was experienced in keeping the piston rod and valve spindle glands steam tight for more than a week, after which time the glands had to be repacked.

At Devonport, we were fortunate in obtaining the remaining stocks of the now obsolete ' sausage ' packing. All glands were repacked with this packing and, apart from an occasional ' nip up ', there has been no need to touch them for periods up to six months. In addition, the piston rods show no sign of scoring, a large feature in the last commission's defect list. It is thought that a similar packing might be introduced in the *Rate Book* as there is no selection of packing for glands of this type.

Comment by A.O., Colombo

The old ' sausage ' packing still retains the confidence of many engineer officers and, as stated in the report, proved superior to the asbestos packing in this instance. It is suggested that Admiralty call for reports from all ships on the merits and demerits of the two types of packing. The replies may well result in ' sausage ' packing re-engaging for an indefinite period of service.

Comment

The experience reported with these packings is not a common one. Doubt exists as to the composition of the obsolete ' sausage ' packing and before a decision is given on this matter, it would be appreciated if a piece of this packing could be forwarded to E.-in-C. (Material/Oils Section).

Motor Boats (Enfield H.O.2 and V.S.I.)—H.M.S. ' Loch Insh '

Both engines have required a minimum of maintenance, apart from the throttle cables which have parted at either end with monotonous regularity.

Difficulty was found in turning over the H.O.2 engine during the very cold weather of January, 1956. The starting handle was twice broken when attempting to turn the engine over T.D.C. on compression. Once started, the engine ran satisfactorily, giving no indication of over-compression. It is thought that the new Start Pilot equipment is not the complete answer, as the engine starts

quite easily with the ' ether wick ' starting device once the engine has been turned over on compression. The ' answer to the motor boat driver's prayer ' would seem to be an electric starter but, as its absence is considered to be one of the advantages of the engine, it is felt that there is no point in pressing the matter.

Comment

No objection is seen to the fitting of rod controls in lieu of Bowden cables. This is being done in new construction boats.

The use of lubricating oil O.M.D.60 should facilitate the turning of engines during cold weather.

The Start Pilot equipment is considered to be superior to ether in that the fluid is stored in self-contained capsules and has a slower rate of burning. Reports received, concerning the starting of Enfield engines, have been conflicting in the extreme. An A.F.O. is being issued calling for further reports ; further consideration will be given to the fitting of electric starting if reports indicate it to be desirable.

Spare Gear—H.M.S. ' Loch Insh '

During the 1953/54 modernization refit, the combined engineer's spare gear store and workshop was converted into a messdeck. The spare gear is now stowed in the steering gear and stern gland compartments and is subjected to heavy condensation due to climatic conditions and lack of ventilation in these compartments. In view of the present trend of the policy of ' repair by replacement ' it is considered that a more suitable space is desirable for the stowage of engineer's spare gear.

A. and A. No. 407 provides for the conversion of No. 3 and 4 F.F.O. tanks into store rooms, ostensibly for the Royal Marine detachment now carried in Loch Class frigates serving in the Persian Gulf. Experience in two frigates has proved that one store room is sufficient for the use of the Marines and it is proposed that the other store room be named as the engineer's spare gear store, as opposed to ' first come, first served '.

Comment by A.O., Colombo

The unsuitability of the steering gear and stern gland compartments for the stowage of spare gear is fully concurred in. It would appear that one of the store rooms now allotted to the R.M. detachment could with advantage be made available for the stowage of engineer's spare gear.

Comment

As a long-term policy for modernized Loch Class frigates, A. and A. No. 407 was approved to convert No. 3 and No. 4 F.F.O. tanks to water-tight compartments, to accommodate two permanent air conditioning plants. These plants are not available at present, and prior to their eventual fitting, A.L. D.1007/57 dated 16th April, 1957, now gives approval that until completion of A. and A. No. 407, the two ex-F.F.O. tanks are to be used as a moving equipment store and an engineer's store.

External Boiler Cleaning—H.M.S. ' Vigo '

T.C.V. *Bern* has carried out her first water wash on *Vigo's* boilers, and it is quite clear that, even with an inexperienced crew, there is a very considerable

time saving. On this occasion, the time to wash both boilers, excluding time for sealing and drying out furnaces, was seven hours, and there is little doubt that this could easily be reduced to four hours. There was no interference with concurrent refitting work on steam lines, and *Bern's* equipment made a thorough job of pumping out furnaces and bilges. However, there is still a need for the provision of a lighter in the Port area capable of accepting a mixture of oil, soot and water, and this matter is being raised officially.

Comment by S.E.O.

The success of this operation bears out the suggestion made by H.M.S. *Vigo* in a previous report that external assistance during water washing would materially save time and aid maintenance. It is suggested, however, that the use of a T.C.V. for this work is an extravagance and that a dumb lighter equipped with a boiler and pump would suffice and at the same time would provide a ready receptacle for oily, sooty water.

Comment by C.E.O.

With reference to the remarks in the report by H.M.S. *Vigo*, and the comments of the Squadron Engineer Officer, the Tank Cleaning Vessels provide assistance for boiler cleaning when not otherwise employed. A second vessel is not available in the port, and the provision of a dumb lighter might cause unnecessary employment of these Tank Cleaning Vessels. The need for a lighter capable of accepting a mixture of oil, soot and water is agreed, however, although the eventual disposal of such a mixture presents a problem for the Superintending Naval Store Officer.

Comment

The whole question of the operation of T.C.V.s, with particular reference to the disposal of sludge arising from tank cleaning and boiler water washing, has recently been discussed by E.-in-C. with representatives of the Administrative Authorities at Portsmouth, Devonport and Chatham and this matter is receiving active consideration.

English Electric Diesel Generators Type 6H—Portsmouth Squadron

The poor performance of two of the three machines fitted has now been traced to partial failure of the fuel pump drives. This has occurred through the shearing of the woodruff key which transmits the drive from the fuel pump fly-wheel to the pump shaft, accompanied by failure of the pump shaft keyway.

The assembly is shown on drawing number D.D.1597/6, the items being:—

Fuel pump fly-wheel : item 842
Fuel pump shaft : item 5850
The woodruff key is not itemized.

It appears that the key and keyway are not strong enough for the job, and they certainly do not look robust enough.

Making good these defects has so far led to the satisfactory performance of one generator.

An interesting point was brought to light through these pump failures. The spare fuel pump held onboard was taken to Blackbrook Farm for check calibration where, despite its being packaged, the pump was found to be seized. It is understood that this seizure may have resulted from the makers having packaged the pump without first removing the Diesel fuel. Whatever the reason, it does appear that this is a case where the method of packaging spare gear is especially important.

Comment by S.E.O.

If there is any substance in the suggestion that seizure of the spare pump may have been caused by the presence of Diesel fuel, it is thought possible that seizure, or partial seizure, of the pumps on the engines may have occurred during periods that the machines were not in use and unavoidably not turned, and that progressive weakening of the drive key may have taken place on successive occasions of starting.

Comment

These pumps were supplied by C.A.V. who state that, in view of the long time these pumps have given satisfactory service, they are at a loss to account for the report received.

It is regarded as extremely difficult for C.A.V. to arrange a modification to the design. A possible cause of the failure may be due to the fact that the fuel pump fly-wheel was inadequately tightened on the camshaft. It would be appreciated if it could be stated whether this was the cause or, if not, the damaged shaft and/or a sample shaft could be forwardeed to E.-in-C. (I.C.E. section), for subsequent examination by C.A.V.

The failure to P.I.P. correctly is undoubtedly due to these being old orders, and this should not occur with the present P.I.P. procedure.

Main Engines—H.M.S. ' Reclaim '

(*a*) The H.P. and I.P. valve rod packings of both engines suffer as a result of water being carried over with steam ; the Spirax steam traps fitted in the main steam system appear unable to efficiently cope with the water. It is considered, from experience in an *Algerine* Class minesweeper, that bucket traps of the Drayton-Armstrong type would be more suitable and an A. and A. is being proposed to cover this point.

(*b*) Both main engines exhaust to condensers where the vacuum, on getting under way, is usually between five and ten inches. This is due to the upper deck winches and capstan exhausting to a line connecting these consensers. As the ship often spends long periods re-mooring, necessitating the continual use of winches, it would be much more efficient if this exhaust line was fitted with a spring-loaded valve—thereby preserving a 20 to 25-inch vacuum in the condensers.

Comment by S.E.O.

Having regard to the special duties performed by *Reclaim* it is considered that the fitting of a spring-loaded valve on the exhaust line would be advantageous.

Comment

(*a*) From experience, the existing traps should give efficient service under the steam conditions in *Reclaim* and wholesale replacement is not supported. It has been agreed, however, that the existing steam traps in *Reclaim* should be replaced by bucket type traps when the former become defective beyond repair.

(*b*) The practice of exhausting deck machinery direct to the condenser is extensively used and is quite satisfactory under normal intermittent operation. It is agreed that, in the circumstances reported, the provision of a spring-loaded valve in the exhaust line would be advantageous and this question should be raised officially.

Oxy-Helium System—H.M.S. ' Reclaim '

After the dockyard refit of the oxy-helium drier and re-activation system stop valve, cross-connection and drain valves, many valves and joints leaked under test with helium. Almost three weeks of intensive effort was required to get the system gas-tight and it is considered that it will not stay that way for any length of time. The main trouble appears to be that the valves and joints are too close together and the pipework is too rigid. Rearrangement necessary to overcome this would probably be too great to be an economical proposition.

It would be useful to know of any lubricant which can be used with safety on the threads of oxy-helium valves.

Comment

The difficulty in maintaining a helium system gas-tight is understood and is due, in this instance, mainly to the lack of a suitable high temperature stop valve. Efforts are being made to obtain one and in the event of a suitable design being found, action will be initiated to replace those existing.

The system can, however, be made serviceable ; *Kingfisher*, in which a similar system is fitted, reports a loss of helium of less than three per cent per annum.

Molybdenum disulphide may be used as a lubricant on the external surfaces of valves and couplings, care being taken not to contaminate the oxy-helium system.

Miscellaneous—Portsmouth Squadron

It would be interesting to know when a new type working head gear for engineering mechanics may be expected to come into service. Several years ago rumours were afoot that ' baseball type ' caps were being tried. There is a definite need for a working cap especially as cap covers are now becoming redundant.

Comment by S.E.O.

A close fitting cap of the baseball or skull type would provide a more sensible and practical form of headgear than the normal cap, especially when working in dirty and confined spaces.

Comment

One series of trials has been carried out, but reports from sea were very inconclusive.

A second series is now in force with :—

(*a*) Peak type. Blue. ' Baseball '

(*b*) Skull type. Black shirting

(*c*) Skull type. Blue towelling.

Final decision is expected in about six months.

Main Engines—(Paxman 12 R.P.H.)—H.M.S. ' Rampart '

While in the Mediterranean recently, it was noted that, according to the Amphibious Squadron standing orders, r.p.m. are limited to 1,000 with intermittent increases to 1,025 and 1,050 for station keeping purposes only. It was verbally stated that the reason for this limitation was to cut down piston ring

and liner wear but it would be appreciated if it could be ascertained whether this is a general order from E.-in-C. in respect of these engines. *Rampart* has in the past often been run at 1,100 r.p.m. for periods of two hours, and there appears to be no undue increase in lubricating oil consumption or excessive blue smoke which would reveal piston or liner wear. It is felt that accurate synchronization of the four main engines is a far greater determining factor in the occurrence or non-occurrence of the above defects than piston speed.

Comment

The cruising speed for engines installed in an L.C.T.(8) is 1,100 r.p.m. with a limiting exhaust temperature of 640 degrees F. This applies only when all four engines are in use.

For further information BR.1986, Chapter 3, paragraph 0304, refers.

Rudder Clearances—H.M.S. ' Vigo '

At the recent docking, M.C.D., Portsmouth, obtained the following rudder clearances :—

Transom bearing :	0·022 inches
Hull bush inboard :	0·040 inches
Hull bush outboard :	0·090 inches

and stated that the permissible clearance before resleeving is required, is 0·080 inches measured at the inboard position.

This interpretation does not agree with E.M. Article 89, paragraph (3), possibly because this particular paragraph is not precise enough in stating the position of maximum permissible clearance.

This point may appear trivial, but since the newly packed rudder glands now leak almost as much as before, after only 20 hours' steaming, there is some doubt about M.C.D.'s ruling.

Comment by S.E.O.

It would appear desirable that the permissible clearance before resleeving should apply to any position.

Comment by D.N.C.

M.C.D. Portsmouth's ruling was apparently based upon the instructions contained in A.F.O. 144/31 which specified the measurement of the maximum clearance, viz. 0·080 in., to be at the inboard side of the bearing.

While these instructions, which existed for many years, proved generally satisfactory, it is considered that those now contained in B.R.16 should be interpreted to mean the maximum clearances allowable in any position.

Fire Fighting and Damage Control—H.M.S. ' Reclaim '

During the refit period, observations were made on the repairs to hatches, gas flaps and water-tight doors, which in the main necessitated the re-rubbering of these items. Even in such a small ship as this the job required several weeks' work by skilled shipwrights and their labourers.

The method of securing these rubbers—by thin sprips of metal and scores of brass screws is, to say the least, antiquated and never gives a neat and tidy job. It is considered that there must be some chemical compound on the market

today capable of fixing the rubbers securely and of being applied with semi-skilled labour. If there is not, it is suggested that research be carried out ; success in such a venture would result in utilizing skilled men for more important work and probably the saving of tons of non-ferrous screws annually.

Comment by S.E.O.

Provision of a satisfactory adhesive for securing door and hatch rubbers would save time, labour and money. It is not uncommon to have to drill out broken screws and re-tap. If necessary, to improve adhesion the rubber could be set into a dove-tailed strip permanently screwed or spot welded to the door, hatch or flap.

Comment by D.N.C.

Adhesives are available from store, e.g. Patt. 388 Rubber Resin Compound, which would ensure the rubber joints, but, where doors and hatches are liable to ' stick ' through being closed for some time, it is considered doubtful whether an adhesive alone would then be effective.

If an adhesive is used in addition to the present method of fixing, a reduction in the number of fixing screws should be possible.

Rudders—H.M.S. ' Rampart '

When the ship's bottom fittings were examined it was found that both rudders were showing signs of the welding splitting along the top horizontal welded seam. Permission was obtained and the spare rudders were fitted during the course of a low tide. No difficulty was experienced during this operation. It has been observed that during four months at least three L.C.T.s have lost their rudders through the welding splitting as mentioned above. All rudders have been strengthened by modification which entails riveting a plate on each side of the rudder blade. This plate is below the site of the usual splits and does not seem to help matters. The steering compartment is an overhanging compartment, never wholly supported by the water underneath. In view of the vibration from the propellers, ever present here and amplified by the above fact, it is suggested that the answer is a more robust rudder in every way and a responsibility of the ship to keep the stern as deep in the water as possible by means of judicious ballasting. The rudder glands have been repacked twice during the period of the report but wear of the rudder bearings is so great at the moment that the packing shudders to pieces within a week. This entails regular pumping of the steering compartment at sea. In harbour the glands can be brought clear of the water by means of pumping out the after ballast tanks.

Comment by D.N.C.

The rudders are so designed as to fail, rather than transmit forces which would damage the steering gear on grounding. Spare blades are carried for replacement by ships staff.

The welding between rudder blade and top flange will be examined in the light of this report.

ORDNANCE ENGINEERING

Comments by D.N.O.

Bomb Lift Hydraulic Valves—H.M.S. ' Bulwark '

Frequent lifting of the combined air relief and snift valve for the exhaust tank of the bomb lift hydraulic system led to a careful examination of the valves. It was found that the relief valve springs fitted were not to the dimensions given in drawings of the equipment. Examination of spare springs showed that these were also manufactured to different specifications from those given in the drawings.

The springs fitted were found to lift at a pressure of 55 lb/sq in against a lifting pressure of 80 lb/sq in for the springs shown in the drawings.

As a temporary measure a $\frac{1}{4}$ in. washer was inserted between the spring and the valve cap, increasing the initial deflection of the spring and thus raising the lifting pressure to approximately 75 lb/sq in. New springs were demanded, but those supplied were of the same dimensions as the items originally fitted, and have not been used.

Comment

The springs shown in drawings were a modification brought in after the original manufacturing drawings had been issued, and it now appears that the modification was not incorporated in the original manufacture of the equipments, nor in the manufacture of spare springs. Arrangements have now been made for the supply of sufficient of the modified type springs for fitting in all bomb lifts and for inclusion in sets of spare parts. Instructions have been given on the modification required to the faucet in the valve cap to facilitate fitting of the modified springs.

The need for modification to the spring is of some interest. In the original design of the equipment, it was calculated that the pressure in the ' exhaust ' lines would never exceed 50 lb/sq in under normal working conditions, and the original spring, therefore, appeared suitable for its purpose. Subsequently, however, trouble in other similar hydraulic systems led to investigation of the effect of gravity on the considerable volume of fluid at a higher level than the exhaust tank in this system, and it was realized that a pressure of 50 lb/sq in at the outlet ports of the various machines would create pressures up to 75 lb/sq in at the exhaust tank.

A.F.C.T. Mk. 6 Auto Cross-level Unit—H.M.S. ' Ceylon '

During periodic tests of the unit it was found that the tan. gun elevation I-pot was giving a constant maximum output. This was caused by misalignment between the I-pot, the gun elevation drive and the drive to the micro-switches limiting the output of the I-pot to tangents of angles between —15 and +65 degrees.

The gear ratio of the drive for gun elevation to the micro-switches is 4 : 5, whereas the drive for gun elevation to the potentiometer has a gear ratio of 16 : 15. Thus, if the elevation drive is taken beyond its normal limits by ' sectoring ' or by the table ' running away ' due to a power failure, there is bound to be a misalignment introduced, as there was in this case. Realignment of the drives can only be achieved by removal of the complete elevation transmission unit from the table, a lengthy process.

Misalignment could be prevented by either the fitting of permanent stops to the gun elevation drive, or the fitting of drives giving 1 : 1 gear ratio to both the I-pot and the micro-switch cam.

Comment

It is agreed that this ' loss of sector ' can occur, and that although the unit can be realigned without being completely removed, considerable difficulties may be experienced.

The tangent function is not produced in this unit by a normal (linear) I-pot, but by a cam-calibrated potentiometer : thus, any change in the gear ratio of the drive would give incorrect outputs, unless a non-standard potentiometer were developed to suit this application only. Such a feature is undesirable in itself, and has the additional disadvantage of reducing the voltage scale factor of the output with the attendant necessity to re-calibrate the whole system.

The fitting of permanent stops to the gun elevation drive would present considerable difficulty, since the stops would have to be sufficiently robust to withstand the torque of the oil motor, and would have to be positioned so that the torque would not strain the gearing and drives not designed to carry such heavy loads.

A design modification to provide a misalignment indicator to facilitate realignment, and to give sufficient warning of the existence of misalignment, is being investigated.

Dual Ballistic Unit—H.M.S. ' Defender '

Trouble has been experienced from persistent leakage of oil from banjo couplings in the hydraulic system of the unit. New fibre washers were fitted but leaks occurred within a week of fitting. The joints were again disconnected and the joint faces skimmed, the washers again replaced, and the joints coated with Heldite. The equipment has now been operating for two months without further leakage.

Comment

Manufacturing instructions for these units specified that Dowty sealing washers were to be used for the banjo couplings, and it has been found that fibre washers were fitted in error in some units. This error is now being rectified.

The use of Heldite for joints in the hydraulic systems of precision units of this description is not recommended, as there is danger of the Heldite contaminating the oil. The Dowty sealing washers are of synthetic rubber, with metal strips along the non-jointing faces to limit extrusion.

4·5 in. Mk. 6 Mounting Ammunition Hoists—H.M.S. ' Delight '

Investigation into the cause of intermittent jamming of hoists has shown that in some cases the hoist guide rollers were not properly secured to the moving pawl pin. Instructions in the drawings state that the countersunk securing screws should be locked by caulking the surrounding metal, and this had not been done. The screws consequently ' slack back ', foul the lifting bar guides, so jamming the hoist.

Comment

It is quite clear that this is a case of incomplete compliance with manufacturing instructions. It will be appreciated that such faults are very difficult to detect during trials of equipments, since the results of ' skimped ' work may not be apparent for some years after assembly. The attention of Admiralty representatives at contractors' works has been drawn to this report, but the only sure way of preventing minor omissions of this kind from causing serious delays is by careful perusal of drawings when carrying out examinations, which was carried out in this case.

4·5 in. Mk. 4 Mounting Recoil System—H.M.S. ' Barfleur '

It was found during examination of the recoil cylinders that the sleeve non-return valves had been machined in such a way, that the ports over-lapped the inner seating, so that the passage of fluid during run-out was not sufficiently restricted. Although the effects of this have not been serious in *Barfleur*, the reduced cushioning effect at the end of run-out may have been a contributory factor to the failure of breech block buffers reported from other ships.

Comment

It is agreed that incorrectly manufactured valves would contribute to failures of breech block buffers, which have been causing some trouble recently. However, trials have been carried out on a mounting with all components of the recoil system to drawing dimensions, and failures of the buffer have still occurred, so that it must be presumed that the valves in *Barfleur* are an isolated case of incorrect manufacture. Authorities concerned have been requested to inspect the valves at the first opportunity in case this is not so.

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

While running the director in power, the G.R.U. ' ran away ' in training on a number of occasions. It was found that the dashpot on the lateral precession linkage was loose, as the screws securing it in position had slacked back. On tightening the screws, the dashpot piston became jammed in the cylinder, due to misalignment between the components of the unit. A packing piece of liner brass was fitted under the dashpot bracket and the piston and cylinder were lined up. No further trouble has occurred.

Although the fault in this case probably lies in original assembly, it seems that dowels should be used to ensure correct and permanent alignment of the dashpot bracket.

Comment

It is agreed that the fault must have been present on assembly, and it is presumed that the securing screws were not properly tightened and that subsequent vibration had caused them to slacken further. Arrangements have now been made to dowel the dashpot bracket in position.

Stowage of Spare Gear—H.M.S. ' Leopard '

The arrangement for stowage of gunnery equipment spare gear is not entirely satisfactory. The boxes are, in some cases, of different sizes from those given in official drawings, and the stowage positions do not make allowance for the overall sizes of those boxes which are correctly listed (handles, battens and locks often take up two or three extra inches). In many cases the boxes are of considerable size and contain only small parts of which there are many hundreds: the size and weight of these boxes makes them very difficult to handle in the space provided.

The results of this are that very few of the boxes can be stowed in the positions shown on the drawings, and that even when rearrangements are made to effect the most economical stowage, there is still not sufficient space for all the boxes.

Comment

Alarming increases in the complexity of equipments over the past few years, and the inevitable increasing use of the principle of ' repair by replacement ', have certainly caused many headaches in modern ships (and much heart-

searching at Admiralty). Some progress has been made in defining accurately the spare gear required for each equipment, and the policy of packing the spares in standard size boxes according to a common schedule for each equipment is beginning to bear some fruit. Unfortunately, ' standard ' schemes are never so standard as one has hoped, and the sizes of such mundane articles as wooden boxes are subject to the ' add a bit more for luck ' craftmanship.

It can only be said that the lessons are being learned, and that attempts are being made to rectify errors made in ships already built, and to avoid making the same errors in new ships.

40 mm. Mk. 9* Mounting Elevating Gear—H.M.S. ' Mutine '

During maintenance routines the depression stop was found to be canted, and the bracket securing it to the elevating arc sheared across the bolt holes. Examination of other mountings showed that the brackets of these had begun to shear. The cause of this appeared to be the slackening of the electrical cut-off adjustment screws, allowing heavy contact with the stops at high speeds of depression.

To prevent further damage of this kind, the adjustment screws are being checked weekly and adjusted so that at slow speeds the mounting stops with $1\frac{1}{2}$ in. clearance between the fixed stop and the pad piece.

Comment

The action taken is concurred in. A further check of the operation of the gear is to run the gun into the limits at full speed, when it should come to rest $\frac{1}{4}$ in. from the mechanical stop.