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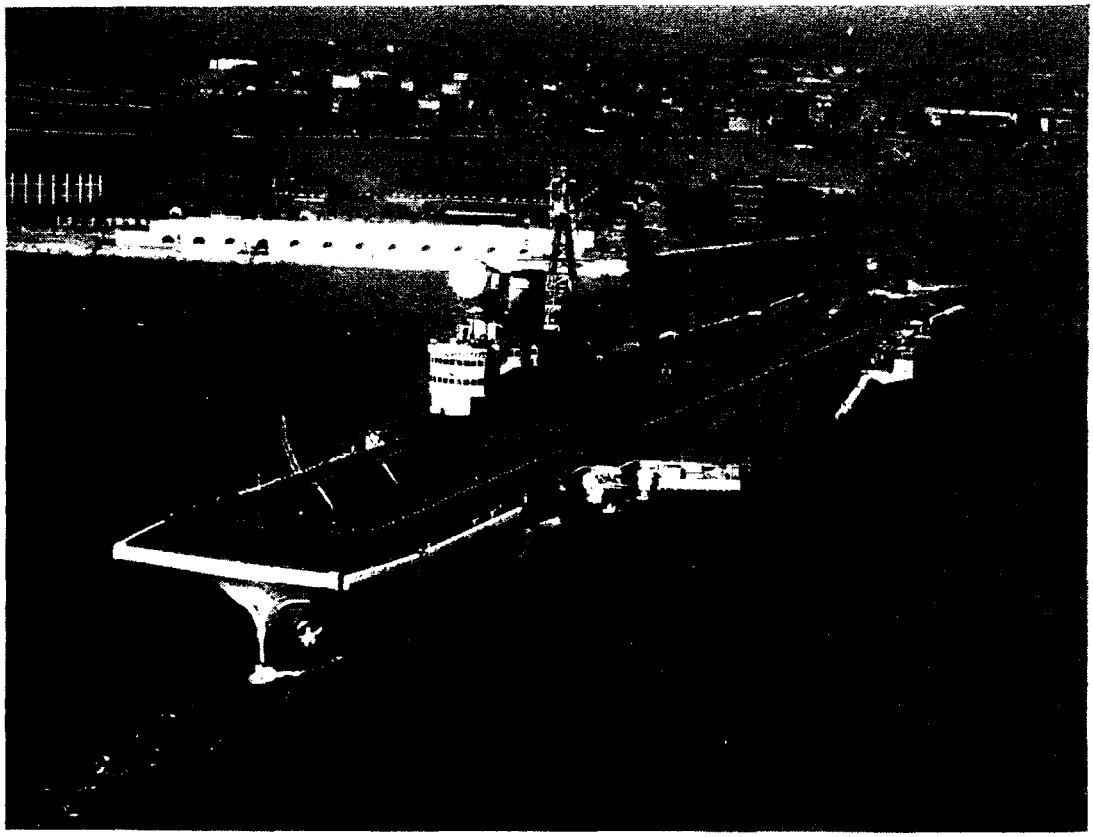
It is hoped that all engineer officers will join if they have not already done so and thus make *Thunderer* the real 'Alma Mater' for their specialization on a par with the other technical schools which have substantial numbers of life members.



H.M.S. ' VICTORIOUS '

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 D.M.E.

Main Engines—H.M.S. ' Daring '

(*a*) To check drains clear requires, in this ship, complete removal of the drain valve boxes. A simple modification should halve the work required for this important routine examination ; it is suggested that the drain valve should be attached to the side of a short vertical pipe, attached at its upper end to the cylinder drain flange, and closed at the bottom by a bolted blank.

(*b*) The automatic gland steam controllers have been inoperative throughout the commission, and reliance on this complex device is unlikely when control by hand is so simple. If automatic operation is required, cam control on the sequential nozzle valve operating shaft would suffice. A manual limited adjustment on the cam follower should satisfy the purists.

(*c*) No trust is placed in the Drayton closed exhaust controller. It is ridiculously complex for the job it has to perform. The Weir pneumatic valve on the other hand is simple. While no great success has been achieved with the Weir valve either, at least it looks as if it could work.

(*d*) Is it more economical to use live steam on evaporators and to keep exhaust range pressures down to 5 lb/sq in., or to use exhaust steam, accepting pressures up to 12-15 lb/sq in. in the exhaust range ?

Experience in *Daring* shows that the latter seems to be more economical. If this is so, why is it desirable to keep the exhaust range pressure down to 5 lb/sq in. ? Examination of the Yarway traps and reciprocating pump piston rings would probably provide the answers to these questions.

(*e*) ' B ' unit gear case and drain tank are protected by ' Rustban ' paint. On examination the paint was found to be in excellent condition. At the same time, the unprotected gearcase and drain tank in ' A ' unit were seen to be almost equally good. Lack of rust in the unprotected unit is considered to be due to the closing of the gearcase vent circuit and vapour suppression on the glands.

Is the expense of ' Rustban ' coating then justified ? Doubtless the coated casings would withstand severe salt water contamination far better than bare steel, but does this matter when the gearing itself cannot be protected ?

(*f*) At the examination mentioned in (*e*) it was found that the inclined perforated baffle in ' B ' drain tank had been dismantled. No instruction requiring this action was known and it was replaced.

Comment

(*a*) This modification is not favoured, since checking drains by removal of the bottom blank only, would not cover any possible blockage or defect in the valve itself. The intention must always be to check the efficacy of the valve and its operating gear, as well as to see that the drainage path is clear.

This is reflected in Arts. 127(4) and 135(2) of B.R. 16.

(*b*) H.M.S. *Daring* is the only ship fitted with the Drayton three-valve type of automatic gland steam controller.

Reports from other ships of the Class have, on the whole, been satisfactory

Daring is requested to forward, on form S.2022, defects found in, and criticisms of, the existing equipment, so that consideration may be given to changing it either for one of the weight-loaded variety or for a type fitted in other ships of the Class.

(*c*) An interim report on the operation of the Weir valves with new diaphragms has been received, which sounds quite hopeful.

The question of changing to the above type of valve for all ships of the Class will be considered when the final report comes in.

Before any official A. and A. action can be taken, the nature of the defects experienced should be reported on form S.2022.

(*d*) Investigation of the overall heat balance indicates that it is always much more economical to run the evaporators on closed exhaust.

If lower evaporator output can be accepted, the lower coil steam temperature gives rise to much smaller $CaSO_4$ deposits, and greater output is available from the T.G.s in harbour.

During a full power trial, however, it is recommended that closed exhaust pressure is dropped to 8-10 lb/sq in. to reduce the back pressure on the main

feed pumps.

(*e*) 'Rustban' is used to prevent oxidation of the steel gearcase. The chances of an oxide film forming on the gearing itself are very much less because of the high finish obtained.

The main worry is the rust formed by condensed moisture on the inside of the gearcase tops. A very small amount of this rust falling into the oil can cause rapid deterioration :—

(i) as an oxidation catalyst

(ii) as an emulsion stabilizer.

(*f*) The perforated baffle was probably dismantled in the past in an attempt to cure the tendency for the drain tank level to drop drastically when flashing up with cold oil.

It should be left in place because it is considered to make a valuable contribution to deaeration of the system.

Main Machinery—H.M.S. 'Daring'

(*a*) Lubricating oil temperature controllers are operable but not used. Temperature control is effected by throttling the cooling water inlet. Very little adjustment is required, and the necessity for the additional complication is questioned.

(*b*) Condenser steam space internal lagging is deteriorating. Several of the stainless steel plates in 'A' condenser were found to have been removed because the welding had failed.

Comment

(*a*) Lubricating oil temperature control equipment is fitted because it is known that incorrect control of L.O. temperature can result in an increase in gearing losses of the order of 5 per cent over the power range.

This type of equipment is being fitted in new construction ships where the remote control of machinery is required. In order to gain operating experience with L.O. temperature control equipment, it is desirable that where this equipment is fitted in existing ships it should be used.

It is appreciated that this type of equipment does not 'fail to safe', and investigations are in hand to correct this drawback.

Control of lubricating oil temperature by throttling the cooling water inlet is not desirable, since it is liable to result in erosion of the cooler. Where temperature control by regulating the cooling water flow is required it should be effected by throttling the cooling water outlet.

(*b*) It is presumed that the stainless steel plates in 'A' condenser are those originally fitted as part of the internal lagging of the L.P. cylinder. This lagging is performing no useful function and may be removed at the earliest opportunity.

Boilers—H.M.S. 'Daring'

(*a*) The flexibility and ease of control of the Babcock and Wilcox boilers is good, and they are considered to have performed well, but they have serious shortcomings.

Soot blowers, while distributing steam ideally, appear prone to distortion and seizure of elements, and to seizure of poppet valves. Unfortunately, the poppet valves seize in the open position and a soot blower, with two valves

open the whole time, will cost ten tons of feed water. Renewal of poppet valv spindles is tedious and lengthy, and removal of the guides seems almos impossible. A jack, to close seized poppet valves, was made by H.M.S. *Ranpur* but is only moderately successful. Valve spindles removed by dockyard wer very heavily corroded in way of the gland. Since no spares were available, th yard made new spindles in stainless steel, and these have remained free to date No spare elements could be obtained, and straightening of the badly distorte elements is difficult. Provision of large stocks of spares at S.P.D.C.s for soo blowers is required.

(*b*) Pressure testing of boilers after machining of superheater header handhol door facings requires that a test can be applied using auxiliary feed pumps Proposals to simplify observance of E.M. Art. 226(4) in these ships have bee forwarded.

(*c*) Control of water temperature and avoidance of wear of auxiliary fee pump plunger rings when water washing, are easily achieved by temporaril fitting a suitable adaptor in place of the feed heater outlet pressure gaug connection, and heating the water in the feed heater instead of in the reserv feed tank.

(*d*) Two superheater tube failures, one in each boiler, occurred in the las four weeks of the commission. The first was the top tube of the second pas (L.20), and the second in the top tube of the third pass (A.13). The tubes wer split in both cases on the horizontal centre line furnace side of the superhea furnace leg.

If these failures are due to overheating, this may have resulted from lov pressure steaming. It is the practice in *Daring*, when low pressure steaming to limit the steam temperature rise across the superheater to not more tha 50 degrees F. less than at full pressure and full temperature. This limit is se because the Yarway differential pressure indicators are inoperative. Is thi correct ?

(*e*) Safety valve, and safety valve control valve performances have bee unsatisfactory. Lifting pressures are inconsistent and valves hang open for a alarmingly long time. Consistency of lifting pressure on one valve was achieve by increasing all small clearances on control valves to one to two thousandth of an inch above makers' specified maxima, and providing a slight lead at th bottom of the free expansion bush bore. The other fault is considered to hav been caused by distortion of the main valve spindles when the covers wer replaced. One spigot, removed at Devonport, had 0·087 in. throw at the en of the spigot.

Comment

(*a*) As a result of investigations in conjunction with Messrs. Babcock an Wilcox, it is considered that mica lubricated packing for the glands in lieu o the graphited gland packing would provide the answer (Admiralty lette D.6858/57 refers).

Arrangements are being made for elements to be supplied in ' Immaculate 5 ' and it is intended eventually to change all ' Dialloy ' elements and for stock to be built up in S.P.D.C.s.

(*b*) A. and A. 316, to fit sandwich plates at the boiler saturated stop valves has been approved.

(*c*) This method was approved in Admiralty letter D.1089/57.

(*d*) The failure of these tubes is considered to be due to clinker deposits i the superheater.

These deposits deflected the furnace gases through passages around the ' jumper ' tubes.

The ' jumper ' tubes being of extra thickness did not fail, but the normal gauge tubes adjacent to them were also subjected to overheating, and split.

The failure of the superheater tubes is considered to be quite unconnected with low pressure steaming, and it is unnecessary to lay down special temperature limits for low pressure steaming.

(*e*) With regard to the control valves, the specified maker's clearances for all ' Cockburn ' safety valves are being listed shortly in B.R. 1988. Where these dimensions have been found to provide inadequate minimum clearance, details of subsequent modifications found necessary would be appreciated. The modifications carried out by *Daring* in this respect have been noted.

The troubles with bent main valve spindles is becoming a common defect, and it would be appreciated if an S.2022 was rendered stating whether these were the original ' Weldanka ' (18/8) or the stronger spare spindle which should be of 13 per cent chrome steel.

Turbo Generators (General Electric)—H.M.S. ' Daring '

These machines have performed well but are very poor in appearance. They are covered with small pipes and hand-wheels and are most difficult to keep clean.

(*a*) On stripping for examination the whitemetal rings of the combined pump of J.2 were found to be almost completely disintegrated. They were renewed in Cormin alloy, and both sets are now similarly fitted. The Cormin rings of M.4 were in good condition after two years' service.

(*b*) Gearing pinion bearings are reversible but one is fitted with an oil thrower. On examination, the machines were found to have oil throwers at opposite ends. Provision of a drawing of the gearing would assist in deciding which was correct.

Comment

(*a*) A phosphor bronze ring would be preferred to a Cormin alloy one, but both these materials are considered better than whitemetal for this service. The use of whitemetal for sealing rings has now been discontinued.

(*b*) A drawing of the gearing has now been supplied.

Diesel Generators (Paxman 6RPHXZ)—H.M.S. ' Daring '

These generators have given very good service after a bad start. K.3 broke a piston into three pieces for no apparent reason and, after major overhaul, would not govern. The weight carrier forging restricted the outward movement of the weights ; machining restored normal operation.

Recently, two failures of water jacketed exhaust manifolds have occurred. These items are flimsy and past experience in Coastal Forces must have shown that failures are likely ; none the less, no spares are available at S.P.D.C. (U.K.) or Malta.

Comment

Although no previous reports have been received on exhaust manifold failure the new R.P.H. series has an entirely new design.

The stock position of these items in S.P.D.C. is being investigated.

F.F.O. Pumps—H.M.S. ' Daring '

These pumps have suffered six total failures. Two were due to jamming of the Glissard valve after flaking of the Allen headed cushioning steam restrictor plug, one to disintegration of piston rings, one to fracture of the combined piston and pump rod at the plunger securing thread, and the others to bent bridle gear. Only the last two can be attributed to poor operation or maintenance.

Comment

The points dealing with the flaking of the Allen headed cushioning steam restrictor plug and disintegration of piston rings are being taken up with Messrs. G. and J. Weir. If available, pieces of the piston rings should be forwarded to the D.M.E. Division, Admiralty.

Blowers (Allens)—H.M.S. ' Daring '

Two total failures occurred before return to U.K. in June. B.1 ran all bearings and tipped the impeller, presumably through lack of lubrication, and B.2 shed an impeller blade. All were accordingly examined and both A.2 and B.3 were on the point of failure with wiped bearings. Performance of these machines had been normal, oil pressure had not fallen off and they were vibration free. The turbine rotor and impeller of B.3 were renewed and, on trial, this machine vibrated heavily—it has been out of action ever since.

Falling oil pressure in A.3 and B.4 blowers was traced to leakage at the relief valve. This is a most crude device and in both cases the, seating was found to be very roughly machined. The relief valves on the spare pump units were little better.

Mono pump lubricating oil seal failures can put a blower out of action through loss of oil. Fitting new seals to the pump shaft is simple, but removal and replacement of the pump requires also that the oil cooler is shifted. A two-hour job extends to two days. The reason for fitting Mono pumps, with their individual sea suctions and discharges is not appreciated. A simpler (and far more reliable) method would be to take cooling water from the supply to the boiler gland steam evacutor, retaining the firemain alternative supply.

Comment

It is considered that A. and A. 292 will satisfactorily deal with lubrication and circulating water difficulties.

Orders have been placed for blower impellers bladed in aluminium bronze. These should be available in March, 1959.

Extraction Pumps (Allens)—H.M.S. ' Daring '

Three seizures have occurred, two in ' A ' engine room and one in ' B ', through identical causes. In each case a sliver of metal about $\frac{1}{2}$ in. $\times$ $\frac{1}{16}$ in. $\times$ $\frac{1}{64}$ in. lodged between the casing and the bottom of the impeller at the sealing face. These pumps had been back to Allens for fitting of rings to top and bottom faces of the impellers to restore sealing clearances in July, 1955, and it appears that the offending particles of metal were flushed out of recesses in the casting in service. The remarkable feature is that metal of only 0·016 in. thickness can stop a geared turbine of this power.

Comment

This matter has been taken up with the overseer at the makers.

Evaporators (Caird and Rayner)—H.M.S. ' Daring '

Brine suction systems have required constant attention but this has been well worth while.

It is surprising that no better method of injecting evaporator compound has been developed over the years that it has been in use. A very simple device, which allowed a strong compound solution to drip at a controllable rate into a ' well glass ' lamp shade, whence it was sucked into the shell by the shell vacuum, was fitted in H.M.S. *Constance* and copied by H.M.S. *Comus* in 1951. It incorporated a quick cleaning device for removing solidified compound from the adjustable needle valve orifice and gave excellent service. The watchkeeper (and the chief of the watch or engineer officer) could see at once that the compound was being injected, and at the right rate ; it was easily cleaned and adjusted and occupied about one-tenth of the space of the 50-gallon tank which it replaced. A similar device has been fitted to ' B ' evaporator in this ship but, although a distinct improvement on the existing system, it has not yet given the same satisfaction as the original.

Comment

Providing the evaporator compound instructions are complied with and the tank is kept clean no trouble should be experienced.

The ship is requested to forward full details of this equipment so that an assessment of the arrangements can be made.

Air Conditioner (Lightfoot)—H.M.S. ' Daring '

This has given excellent service, but incorrect arrangement has resulted in considerable waste of power. If the circuit is opened out to the main wireless office cooler unit, cold brine is circulated to the mixing and balancing tank, and cools the flag deck. No valve is fitted above the wireless office cooler.

Comment

The balancing tank is an essential part of the system, since it is required to compensate for the variations in volume which occur when the brine changes temperature.

According to the drawings held in this department, a stop valve should be fitted to both the inlet and the outlet pipe of the tank. Closing one of these valves will prevent circulation, while allowing expansion and contraction through the other pipe.

If these valves have been omitted in *Daring* they should be fitted, as a defect, at the next convenient opportunity.

Auxiliary Machinery—General—H.M.S. ' Daring '

Accessibility for breakdown maintenance of almost all auxiliary machinery is poor. The machinery specification should stipulate that the auxiliary machinery contractor and the ship builder are required to demonstrate the full range of maintenance after the installation is complete, and without special tools.

The appearance of the auxiliaries is bad. Until it improves they will be dirt and oil traps and the general appearance of the machinery spaces will be impaired.

Comment

The feeling behind the proposal is appreciated but, if implemented, would entail considerable delay in acceptance of a new ship, because maintenance feasibility could only be demonstrated after installation is complete. The problem is being tackled logically by paying greater attention to maintenance requirements in the design stage, particularly in a much greater use of one-eighth scale models and full sized mock-ups. For example, the G.P. frigate boiler room, engine room and gearing room have been mocked-up full size with the aim of achieving the best possible use of the space available, maintenance being an important consideration.

Forms S.2022 should be raised on equipment which is difficult to maintain.

Regarding appearance of auxiliaries, D.M.E.'s general requirements for machinery state that great emphasis is to be placed on the external appearance and finish of machinery and that designs should avoid dirt, water and oil traps and permit easy cleaning.

Boats (Dorman 2 D.S.M. and Coventry K.F. 4)—H.M.S. ' Daring '

The Dormans are completely reliable. The Coventry is never reliable. One K.F.4 failed at 45 hours running and the replacement at 38 hours running. Piston rings accounted for the first and blower seizure for the second failure.

Comment

The unreliability of the original Coventry K.F.4 engine, as fitted in *Daring's* 16-ft skimmer, is well known, and a new design improved Coventry K.F.4 178/1 engine is being introduced into service. The existing skimmers will be withdrawn from service as soon as is practicable and will be replaced by new type boats with the new Coventry K.F.4 engine.

Workshop Equipment—H.M.S. ' Daring '

The limitations on self-help imposed by the 4½ in. lathes are most annoying. An 8 in. lathe would be worth more than both 4½ in. lathes and the drilling machine.

Comment

It is agreed that a heavy duty 6½ in. lathe would be a useful substitute for the lathes at present carried.

The whole question of workshop machinery in *Daring* is being reviewed.

Hull—H.M.S. ' Daring '

Daring has been fortunate in having no cracks in oil fuel tanks at sea. Since return to harbour for recommissioning, the bulkhead between the midships dieso and No. 5 F.F.O. tank has fractured. The extent of the fracture and the reason for it is not yet known.

Lack of proper painting procedure on building is evident in boiler rooms where no priming coats were used and one finishing coat had been applied to the bare steel. It is not surprising that longitudinals, inaccessible behind cable trays, are now heavily rusted. The highest quality of plate preparation and painting at building are required if machinery spaces are to remain rust free with normal maintenance.

Comment

It is considered that the implementation of A. and A. No. 295 will cure F.F.O. tank bulkhead troubles.

Action was taken during building to impress shipbuilders with the need to preserve structural materials whether worked or unworked. Apparently this was unsuccessful.

However, painting overseers have recently been appointed to the staffs of W.P.S.s and this is expected to result in a higher standard of preservation and painting.

Spare Gear—H.M.S. ' Daring '

Spare gear is expensive and, when required, vital, and yet the stowage arrangements are such that the items are destined to become scrap. Wooden box and plates are not secure against pilfering or damage, are space wasting, are dirt traps and, in all probability, are unsuitable for replacement items because of different methods of packaging. Cupboard and drawer stowage is secure, clean, neat, adaptable, and will occupy less space than the present arrangements.

Comment

A system of rack and bin/box stowage is under development, and consists of fully adjustable racking and a standard range of box sizes.

The rack, which will be of dockyard manufacture, is so designed that it can be ' tailored ' to fit any compartment or space. The design has reached its final stages and drawings will shortly be available.

The development of boxes and bins is not so far advanced. Several ships, however, have been fitted with racking and boxes of wood or light steeel, to standard sizes, which will fill the bill until the final box emerges.

Filing System—H.M.S. ' Daring '

Every ship, every Administrative Authority, every Flag Officer, and the Admiralty, uses a different filing system. Why ? There are no advantages but several disadvantages. If the Navy is to become ' streamlined ' a start should be made with the paper.

Comment

A start has been made in streamlining the Navy's paper work, and A.F.O.s 240, 241 and 242/57 are the result of much inter-departmental discussion to obtain a standard system for documentation of the material aspects of ship upkeep. No move is currently active to produce a standard filing system, but great efforts have been, and are being, made by the Admiralty and the Fleet, to reduce the amount of paper that has to be filed.

This first step is considered to be of major importance and it is hoped to follow it in other directions.

Record Sheets—H.M.S. ' Daring '

Whether the E.O.'s Notebook is retained or replaced by a machinery record book, great advantages would accrue if manufacturers were required to prepare (to specified sizes), gauging charts and record sheets for their own equipment.

These should be incorporated in the machinery records and would provide a continuous check on equipment from shop trials onwards.

At present the method of recording wear and clearances depends largely on the time the first E.O. of a ship can devote to this important item.

Comment

It is intended that the E.O.'s Notebook will be replaced by the Engineering Master Record (A.F.O. 242/57 refers). Reference paragraph 2 (b) (ii) of the above A.F.O., wear record sheets are provided as follows :—

(*a*) *Forms S.*2024(27)—*Wear Sheet—General*

These are not gauging charts, but record sheets for data obtained. They require top and side headings to be inserted, according to the parent equipment, and give no guide as to the readings to be measured. The possibility of providing individual charts for each item of equipment was investigated and found impracticable. The introduction of Class Handbooks for new construction, i.e. B.R.2113 for *Blackwoods* and 2112 for *Whitbys*, does provide gauging information, and coupled with wear sheets (S.2024(27)) should form an excellent record of wear and clearances.

(*b*) *Forms S.*2024(28) *and* (29) *Diesel Engine Wear Record Sheets*

These are gauging charts in addition to record sheets.

Extract from Report—H.M.S. ' Diamond '

It appears to be impossible to cool down one hot engine at sea while still steaming ahead on the other, because if the shaft is broken on the affected engine then it has to be supported either by a bracket and strap in the case of the port shaft, or on a stool for the starboard shaft. These fittings do not seem to be designed to allow for the fact that the shaft has to be kept turning for three to four hours while the turbines cool down.

Comment

The conclusion drawn by the report is correct. The engine must be kept turning, which makes breaking the shaft impracticable.

In cases of ' condenseritis ' there seems to be little point in breaking the shaft once the engine is cool as the extra time involved with the ship stopped would not compensate for the saving of power due to having the shaft trailing, instead of locked, while condenser examination is in progress.

Weirs F.F.O. Pumps—H.M.S. ' Diamond '

(*a*) As a result of experience with these pumps it is considered advisable to examine the piston rings every three months as the quality of the rings seems to vary, and the worst ones do wear and subsequently break after about 500 hours running.

(*b*) Trouble has been experienced in making a steam-tight joint on the two spigots where the Glissard valve box engages into the pump cylinder. This trouble has been cured by using AP.4362 'flexetallic ' joints with the distance ring cut out.

(*c*) There is a very good example of poor design in the arrangements of the studs for bolting up the above valve box. The two studs at the top and bottom of the flange are confined in a space bounded by cast webs running from the body of the valve chest to the flange. As a result no normal spanners can engage the nuts and they have to be worked with a hammer and chisel. This is

a most unsatisfactory arrangement where it is required to exert an even compression all round on the spigot joints.

Comment

(*a*) The opinion that piston ring examination be made at three-monthly intervals constitutes a proposed amendment to the Maintenance Schedule, which, presumably, was not held by *Diamond* at the time of reporting. Form S.2021 (amendment proposal form) should be raised so that the Class Authority can consider the proposal, together with any other similar proposals, and make a schedule amendment for the Class if considered advisable. Such reports will also show whether *Diamond's* is an isolated case of rapid ring wear or whether the question of poor quality rings warrants further investigation.

To assist in any investigations that may be necessary, the ship is requested to forward to D.M.E. Division (Section D/31), any broken pieces of piston ring that may be available.

(*b*) This matter is being investigated. At first sight it would appear that, when using a spiral wound gasket, to maintain alignment of the valve gear and to ensure that the spigot on the valve chest is located correctly, the recess in the cylinder should be machined deeper.

(*c*) In new design this problem has been overcome, and the matter is being taken up with Weirs with a view to cutting away the existing webs in way of the studs.

Hull—H.M.S. ' Diamond '

There have been recurrent splits developing in the fuel tanks through which the propeller shafts run, attributed to fatigue from the vibration and panting in the bulkheads of these tanks at high speeds and during high speed manœuvring, which is more pronounced when the tanks are slack.

Comment

D.N.C. consider that the carrying out of A. and A. No. 295 will cure this defect.

Miscellaneous—H.M.S. ' Diamond '

To date no satisfactory substance has been found to prevent seizure of nuts after prolonged service at high temperatures.

Comment

A molybdenum disulphate paste is being put in the *Rate Book* under the name of ' Thredgard ', which should provide the answer.

Eventually, a five pound tin will be issued to all destroyers, but in the meantime it can be obtained from Crane Packing, Limited, by Local Purchase order.

Nozzle Control Valves—H.M.S. ' Duchess '

Considerable trouble has been experienced with the partial seizure and sticking of nozzle control valves ; full reports have been forwarded. It has now been confirmed that the austenitic cast iron of which the rings are made, is subject to grain growth under high steam temperature conditions. These rings have been replaced by En. 20 steel in one unit, and by monel metal in the other.

Comment by S.E.O.

It seems undesirable to continue experiments at sea with front line ships, on materials for nozzle control valves, when similar proprietary valves must have been in operation at higher temperatures for many years in power stations.

The seriousness of failures of these valves has been frequently demonstrated. It is therefore recommended that a standard, proven material should be adopted for all ships until a better one is proved by long usage at high temperature on shore plants.

Comment

The views expressed by the S.E.O. are appreciated and considerable attention has been given to this matter.

A.M.151632Z/February, 1957, gave instructions that rings should be renewed in 40 to 50 per cent nickel bronze at the earliest opportunity, and A.L. D.3726/57 dated 15th March, 1957, gave a typical composition for 50 per cent nickel bronze and also the proprietary names of suitable quills, if the material had to be purchased. Material of this composition is widely used in proprietary steam valves.

A.L. D.16607/57, dated 5th February, 1958, gave the composition of a newer nickel bronze which was considered even more suitable from the age hardening aspect, but it was not deemed to be necessary to change the original nickel bronze rings for the new material until nozzle valves became due for refit.

Boilers—H.M.S. ' Duchess '

A trial was carried out using Dualmix Type II waterproofing compound for sealing boiler brickwork prior to water washing. This sealing compound appears to have every advantage over Bituplastic, being clean and easy to mix, simple to apply and waterproof and durable when dry. It is hoped that its introduction for water-washing purposes will not be long delayed.

Comment

A new type of sealing compound has now been developed which is a considerable improvement on Dualmix II in that only one application is required. This compound will be introduced into service during the financial year 1958/59.

Firemain—H.M.S. ' Duchess '

The ships firemain has been a constant source of trouble, corrosion and erosion exists in almost every section.

Comment

Although considerable investigation has shown that copper-nickel-iron is the best material for salt water services, it is known to be subject to erosion in positions of very turbulent water flow. Instructions to makers and refitting authorities are shortly to be issued with a view to cutting down turbulence by avoiding sharp bends, bad alignment at junctions, joints, valves, etc., and protrusion of seating material into the base of pipes.

Great importance is attached to the correct mating of bonding strips which should be inspected frequently.

Pre-wetting—H.M.S. ' Duchess '

It is intended to install a permanent pre-wetting system of U.S. Navy design. Preliminary discussions indicate, however, that the total output of the ship's hull and fire, and fire and bilge pumps will be insufficient for the proposed system.

Comment

It is understood that the pre-wetting system using the existing pumps has proved to be reasonably satisfactory.

Consideration is being given to a pre-wetting scheme for *Daring* Class in which the existing 40 tons per hour fire and bilge pumps will be replaced by pumps delivering 75 tons per hour.

Hull—H.M.S. ' Duchess '

(*a*) The problem of keeping bilges dry for sufficient time to allow red lead to dry out properly is a well-known one, thus, during the ship's self-maintenance period, Red Admar was applied as an experiment. The quick drying properties of this paint made the operation a great success and after seven months' service it was found to be still in good condition.

It may well be that Red Admar is not necessarily the best preservative to apply, but it is strongly felt that a quick drying paint is the key to success.

(*b*) Hull maintenance by ships staff has been carried out continuously and much progress has been made. Pictorial Hull Maintenance Schedules have been used and are considered to be a great aid to progress but the paper drawings at present supplied are far too big for any suitable space in the ship. Smaller drawings, or several sections of the ship to the same scale could be used to advantage in a small ship.

Comment

(*a*) Action has now been taken in A.L. D.7588/57 to authorize the use of Red Admar in maintenance of machinery space bilges, in lieu of red lead.

(*b*) The use of visual records of maintenance provided by diagrams of compartments has been discontinued in accordance with the decision promulgated by A.L. D.25126/56 of 4th March, 1957, as it was becoming too complicated.

The diagrams have been replaced by the standard documentation system as promulgated in A.F.O. 240/57.

F.F.O. Tanks—H.M.S. ' Duchess '

(*a*) During operational service in the Eastern Mediterranean, it was necessary to steam for long periods at speeds between 25 and 27 knots. At these speeds considerable vibration of the hull takes place, and on this occasion five out of the six after F.F.O. tanks suffered from fatigue cracking or splitting in the vicinity of the welding.

(*b*) Trials were carried out with Tretite and Trefolex as thread lubricants. These were found to be of little use as such.

So far, no compound has been found which will solve the problem of thread seizure.

Comment

(*a*) It is considered that A. and A. 295, to fit doubling strips behind the

vertical stiffeners of all bulkheads forming the boundaries of F.F.O. tanks, will cure this trouble.

(*b*) Cranes ' Thredgard ', a molybdenum disulphate paste, should solve the problem of thread seizure. (See comment to ' Miscellaneous—H.M.S. *Diamond* ', p. 381).

PRE-WETTING ARRANGEMENTS

The following extracts are taken from a report on the trial of pre-wetting arrangements carried out in H.M.S. ' Lynx ' *in January* 1958.

Equipment

All the ships fire pumps were used on the firemain during the trial. Together they have a capacity of 160 tons per hour and it appears that useful and effective, if not completely ideal, washing down can be achieved with this quantity of water. The Patt. 10321 nozzles appear to be satisfactory for their job, the most effective cone angle for the spray being about 30 degrees. One defect of the present arrangement is that nozzles have to be set individually after the gear has been rigged, which is plainly unacceptable for war. If temporary pre-wetting arrangements of this nature are fitted to a large number of ships, it is suggested that it would pay to manufacture a simple spray nozzle with a fixed cone angle of about 30 degrees. For the present, however, it is intended to drill and pin the Patt. 10321 nozzles supplied for pre-wetting to give this effect.

Coverage

Abaft the Bridge. This coverage is generally satisfactory, though it would be much improved if the spray nozzles were tilted inboard about 15 degrees. At present, a large proportion of the available water is being thrown over the side where it is doing little good. The masts, more than 10 feet above the level of 01 deck, are virtually getting no water. This is not considered to be very important as no significant traffic is expected up the masts.

Forward of the Bridge. The coverage of this area is not very good, particularly on the forecastle, when the siting arrangement shown in the guidance drawing D.N.C. 7/1283 is used. If the two nozzles abreast the breakwater and the two nozzles at the forward end of 01 deck were tilted inboard about 15 degrees the coverage abaft the breakwater should be adequate. The nozzle in the bow, however, is completely ineffective and the forecastle remained dry throughout most of the trial. It was found by experiment that the most effective way of wetting the forecastle was to fit the foremost hose with a breeching piece, Patt. 7315, and two nozzles, Patt. 10321, placed in the bow about 18 inches above the deck and pointing horizontally aft. With the spray cones set at about 30 degrees this gave effective coverage to the area forward of the breakwater.

Permanent Arrangements

It is considered that the only way in which the pre-wetting arrangements under trial could be made more permanent is by running permanent branches from the firemain, fitted with suitable isolating valves, between decks to feed fitted spraying points. To be fully effective, the nozzles would have to stand 2 ft 6 in. to 3 ft above the level of the deck, except in the case of the bow nozzles, with the result that they would be rather vulnerable. It is suggested that if those sections of the gear standing above the weather deck were portable,

preferably with an easily released and assembled connection, they could be removed and stowed when not required. The permanent arrangement would have the advantage that the pre-wetting could be completely controlled from between decks without interfering with the fire fighting facilities, unlike the present arrangement where between deck control can only be achieved at the expense of shutting of four of the hose connections on No. 2 deck.

Engine-Room Fan Trunks

During the trial, the ship was in A.B.C. State ' A '. No difficulty was experienced with water finding its way into vital parts of the ship except that fair quantities of water found their way into the engine rooms through the fan trunks. These inlet and exhaust openings would almost certainly be open when pre-wetting in earnest. At present the openings in the offending trunks are in their vertical outboard faces. The water which reaches the engine room is a nuisance but not greatly significant, but some trouble has been experienced with water getting into the supply leads of the fans. The fan motors are watertight, but in the case of the type A.C.6 fan motors, the supply leads run through a conduit which is not solid drawn and in one case (not, in fact, an engine-room fan) the conduit split, with consequent water damage to the leads. The danger of this damage could be obviated by replacing the conduit by solid drawn tube. To abate the nuisance in the engine room and to give added protection to the fans it is suggested that consideration should be given, at least for future ships, to fitting these trunks with mushroom tops or, if these are too bulky, to modifying the trunking so that the openings face inboard or aft as spray from water or pre-wetting invariably comes from outboard and forward.

Summary of Proposed Modifications

(*a*) To fit permanent piping and isolating valves between decks and portable spray points on the weather deck.

(*b*) If (*a*) cannot be approved then :

(i) To modify all hose-supporting guard rail brackets so that the nozzles are tilted 15 degrees inboard

(ii) To replace the bow nozzle with a breeching piece and two nozzles pointing horizontally aft. An additional nozzle and breeching piece and a suitable clamping bracket would be required for this.

(*c*) To modify the relevant engine-room supply and exhaust fan trunkings so that their openings face inboard or aft.

(*d*) To introduce a simple spray nozzle with fixed cone angle.

Comment by D.N.C. on Proposed Modifications

(*a*) *Permanent arrangements.* Permanent piping is the ultimate goal but will undoubtedly cause additional congestion in the compartments on No. 2 deck and investigations into the most suitable arrangements to be adopted are not yet complete. The disadvantage of the present isolating valves isolating certain hose connections on No. 2 deck as well as the hydrants themselves is agreed and this fault will be corrected in the final arrangement.

(*b*) (*i*) *Brackets for nozzles.* The proposal to modify the guard rail brackets so that the nozzles are tilted 15 degrees inboard is agreed ; drawing N.D.C. 7/1283 will be modified accordingly and an A. and A. item raised.

(*b*) (*ii*) *Bow nozzle.* The proposal to replace the bow nozzle with a breeching piece and two nozzles pointing horizontally aft is agreed ; drawing D.N.C. 7/1283 will be modified accordingly, and arrangements made for the allowance of pre-wetting stores to be increased by one in No. Patt. 7315 breeching piece and one in No. Patt. 10321 nozzle.

(*c*) *Engine-room inlets and exhausts.* In most cases, re-orientating the inlets/exhausts is not practicable. Intake of spray can, however, be appreciably reduced by the use of spray-excluding slats (prototypes of which are now on trial in *Puma* and *Llandaff*) at the openings, and an A. and A. for their general introduction into types 41 and 61 frigates will shortly be raised. No opening can, of course, be expected to completely exclude water under pre-wetting conditions.

(*d*) *Spray-nozzle with fixed cone angle.* It is not agreed that 30 degrees is necessarily the best angle for all applications and hence the introduction of a new spray nozzle with a fixed cone angle of 30 degrees is not contemplated. There is, however, no objection to individual ships making their own arrangements to pin Patt. 10321 nozzles in positions to suit their own requirements, as stated to be the intention of *Lynx*.

ORDNANCE ENGINEERING

Comments by Director-General of Weapons (Surface Division)—(late D.N.O.)

Bomb Lift Equipment—Paliton Armament Transporters—H.M.S. ' Victorious '

The brakes for these transporters may be adjusted by two hexagon-headed bolts which, under some conditions, project downwards between the two ' steering ' wheels to within an inch of the deck. It has been found that the heads of the bolts can foul small projections on the decks, resulting in bending or breaking of the bolts. It is suggested that either the brake adjustment be completely re-designed, or shorter adjustment bolts fitted, longer bolts being used when full adjustment is required.

Comment

These transporters were not originally designed for use in ships, where deck projections constitute an additional hazard. However, arrangements have now been made to provide ' Allen ' type screws in place of hexagon-headed bolts, thereby shortening the overall length of the adjustment without reducing the effective thread length.

6 in. Mark 23 Mounting, Oil System—H.M.S. ' Newfoundland '

Salt water contamination of the hydraulic system of the mounting was discovered when investigating failure of the main pump to give the normal pressure of 1,200 lb/sq in. The main oil tank was found to contain a large quantity of salt water. The Serck oil cooler was isolated, and the complete system was drained ; some 30 gallons of salt water was found in the oil.

It was decided, in an effort to prevent corrosion, to recharge the system with O.M.65 plus one part in ten of sodium nitrite in solution in distilled water of the strength given in B.R.16, i.e., 28 lb of sodium nitrite to 40 gallons of distilled water. The pump was run, and the system flushed through for a total of three hours running on light load (i.e. with all engines declutched). The flushing was done in a series of short periods, the length of which depended on

the oil temperature rise (130 degrees F. not being exceeded in any case). Eventually the temperature rise became so rapid that it was decided to stop flushing and drain down.

The system was extensively stripped, and pump and engine casings thoroughly drained. A heavy yellow sludge had formed, which was presumably the cause of the rapid temperature rise. A sample engine was stripped, and found to be in excellent condition with no signs of corrosion.

The system was recharged with oil, a new cooler was fitted, and no further trouble has been experienced.

The original cooler was examined by dockyard, and a number of tube joints in the top plate were found to be leaking. The cooler had been surveyed 34 months previously (the required periodicity of survey being five-yearly). The only unusual event during the period preceding discovery of the defect was that the firemain cooling water supply had been left on for 24 hours with a cooler inlet pressure of 15 lb/sq in.

Comment

Failure of the tube joints in these coolers has not been reported previously. The extent of the contamination may be partly due to the fact that firemain pressure had been left on, but it is not considered that this action is in itself dangerous. The examinations and surveys of the oil coolers given in B.R.292 are considered to be adequate to prevent this kind of failure in the majority of cases, and such failures which do occur should be quickly found from observation of performance or normal checking of the hydraulic fluid.

The method used for flushing through the system is of interest. In the circumstances the use of sodium nitrite solution was probably the best method to use, since salt concentration gives a more serious risk of corrosion than the presence of water. The use of water displacing fluid (PX.10) would be a possible alternative, but in this case the amount of fluid required would be very large. The use of the centrifugal oil separator provided with 6 in. mountings would be a very lengthy process, and would not remove all the salt contamination. It would be a wise precaution to re-purify the oil by frequent use of the separator for some months after the system had been flushed, and to increase the frequency of testing the oil for presence of water, since it is very difficult to eliminate water from all parts of the system. The system should also be checked for further deposits of the yellow sludge, which is typical of emulsification of oil in water.

4·5 in. 6* Mountings, Loading Trays—H.M.S. ' Diana '

During firing exercises several cartridge cases bounced off the loading tray on ejection, after striking the spent cartridge deflector. It was found that the loading tray was considerably distorted, and the stiffening bar for the tray had come clear of the loading tray guide. Inspection of other loading trays showed that some distortion was present in four of the five other trays fitted.

It is considered that there are insufficient stiffeners to compete with the shocks received by the loading tray during recoil and run-out, and that the existing stiffening bar does not keep the tray properly located in relation to the centre line of the bore.

Comment

A number of other ships have reported distortion of these trays. The trays appear to operate satisfactorily for some years before distorting and it seems that the distortion is an almost inevitable consequence of prolonged use. This

is borne out by experience on other mountings, and modification to provide additional stiffeners to existing trays has proved to be only temporarily successful in preventing distortion. A new design of stiffened loading tray is now being manufactured, and these will be fitted to all mountings when they become available.

Elevation Control Units, Handwheel Drives—H.M.S. ' Duchess '

Considerable difficulties have been experienced in obtaining a satisfactory E.C.U. handwheel drive. During a self-maintenance period the ratchet clutch in the drive was adjusted to its correct loading, and the whole mechanism was inspected and cleaned. On completion, the operator reported that the clutch rendered too easily ; the loading was accordingly increased. The result of this was the failure of two 45-tooth gear-wheels in the drive.

It was subsequently found that one of the bearing brackets on the drive was slightly misaligned, that the two gear-wheels concerned were not meshing over the full tooth width, and that the shafts carrying the gear-wheels had been re-drilled on previous occasions, presumably when earlier failures had occurred.

Although the immediate causes of failure were probably stiffness due to misalignment and incorrect meshing of the gears, it may be advisable to replace the 45-tooth wheels with 30-tooth 20 D.P. wheels with the same nominal P.C.D., as this point in the gear train appears to be critical from the loading viewpoint. It is appreciated that this may not be acceptable from the design standpoint, as the wheels now fitted act as a load limiting factor.

Comment

Similar failures have occurred in a number of E.C.U.s and T.C.U.s in service, and although stiffness has been present in the drives in some cases, in others it has been found necessary to increase the clutch loading solely to cope with different handling characteristics of operators. There appears to be a very critical point between comfort of operation in tracking a target and continual slipping of the clutch, and it is often necessary to increase the clutch loading to a point where the gear wheels are overloaded.

Although strengthening of gear wheels in a drive is not generally considered to be very desirable, it has been decided that in this case there is no alternative, and action is in hand to authorize a modification to fit gears of increased face width.

T.S. Officer's Control Panel—H.M.S. ' Carron '

During trials it was observed that there were large variable and unpredictable errors in readings on the future range dial of the panel. It was found that the pointer could be deflected through a large angle by touching the face of the meter, and any attempt to clean the face made the meter completely unusable. The meter made no attempt to return to its correct reading after being deflected.

The meter face is made from perspex, the original glass front having been replaced after breakage. It is thought that erratic performance may be due to accumulations of static electricity in the perspex, which is understood to be prone to such effects.

Comment

The diagnosis of the source of errors was almost certainly correct : when the perspex face was replaced by glass the future range pointer worked correctly.

4·5 in. Mark 5 Mounting, Loading Tray—H.M.S. ' Cavendish '

After only twenty-one months in service, it was found that the power rammer return springs in three mountings were all weakened and were reduced in ' free ' length by up to 0·55 inches. This caused only partial return of the rammers, and the consequent incorrect loading caused jams.

Comment

Examination of the records of usage of these springs in ships show that there has been a tendency to failure in a number of cases. The deterioration is not rapid and since it can be measured whenever the assembly is dismantled for cleaning and examination, it is not considered that re-design is necessary. Replacement springs are being included in ' A ' sets of spares, and maintenance schedules have been amended to draw attention to the necessity for checking the ' free ' lengths of the springs.

S.T.A.A.G. Mark 2M Mod. 1 Mounting—H.M.S. ' Barrosa '

During normal operation the tachometric box began to fill rapidly with oil. When the box was opened the main and servo deflection valve section was leaking. It was found that the cover plate for the valve box was distorted and that cracking had occurred near the securing holes, and the gasket had blown at the position where cracking had occurred.

It is probable that the defect was caused by excessive pressure in the exhaust chamber of the deflection main valve chest, though the cause of such pressure is not known. A reconditioned section was fitted in place of the defective assembly, and this was modified by increasing the number of cover plate securing screws.

Comment

The usual cause of this trouble is incorrect use of the deaerating cock on the mounting. The main oil pump is a constant delivery unit and the pressure is maintained at 210 lb/sq in. by the relief valve passing excess oil back to the exhaust line. If the position of this cock is changed while the main oil pump is running, there will be a build-up of pressure in the exhaust oil system, including the main deflection valve chest. If the deaerating cock is operated correctly, it should not be necessary to increase the number of securing screws in the cover plate ; it is doubtful if such action would prevent the gasket blowing if the correct drill is not carried out.

40 mm Mark 5 Mounting, Limit Switch Gear—H.M.S. ' Loch Fada '

The teeth of both the quadrant and pinion of the elevation limit switch operating drive were found to be stripped, and the cross shaft carrying the quadrant was bent. It seems probable that during a recent inspection of the guns, the weight of the barrels was allowed to rest on the cross shaft, causing the teeth to bind and ultimately fail.

Comment

During the early life of this equipment, it was found that the teeth of the quadrant and pinion were barely strong enough for the loads imposed on them, and there were several failures when marginal increases in torque loading occurred. A modification was introduced to increase the width of the gear tooth faces, but some mountings have been found to be unmodified, probably due to manufacturers' errors. This was found to be the case in *Loch Fada.*

Bending of the cross shaft appears to be an effect rather than a cause of the failure.

A.F.C.B. Mark 10, Clutch Assembly—H.M.S. ' Tenby '

When the range clutch assembly was modified by manufacturers, an ordinary taper pin was used in the spring loading device of the clutch actuating linkage, instead of a split taper pin. As a result, the pin dropped out and was found in the bottom of the box. The effect of this was to prevent the clutch working satisfactorily, and this entailed a major stripping of the box and, subsequently some re-calibration of the units affected.

Comment

This matter was taken up with the manufacturers, who stated that a split taper pin had in fact been used, but that the split portion was not opened up by a sub-contractor who supplied the unit to them. However, the firm concerned admitted liability and the defect was rectified by the manufacturer's representatives. Such defects do occur from time to time and because split taper pins are rather susceptible to wrong assembly, the majority of pinned components in the A.F.C.B. Mark 10 use close fitting parallel pins secured against axial movement by means of circlips.

4·5 Mark 6* Mod. 1 Mounting, Ammunition Hoists—H.M.S. ' Torquay '

During preparation for firing, one cordite hoist on the revolving structure of the mounting failed to operate. It was found that the control valve had jammed. The valve was stripped, and small pieces of metal (apparently solder) were found in the valve body ; some traces of the metal were also found on the valve piston.

The piston and valve body were stoned down and re-assembled, and the hoist then operated satisfactorily. The other cordite hoist control valve was examined, as this had previously jammed on one occasion, but there was no sign of loose solder in this assembly.

Comment

Serious difficulties have been experienced with the control valves, and with the pilot valves, for the ammunition hoists of these mountings. In most cases faults have been attributed to seizure of the valves caused by foreign matter in the hydraulic fluid.

Every effort is made during manufacture, and later during acceptance trials of the equipment, to ensure that the hydraulic systems are free from dirt, heat scale, arising from manufacturing processes, etc. Unfortunately, some of the foreign matter may be quite firmly attached to the pipes or valves, or in a remote ' pocket ' where cleaning processes pass it by, and it is only after a prolonged period of vibration and shock such as is experienced in actual service that such particles become detached and endanger the operation of the equipment. After a time, such failures become less frequent, but during the early life of an equipment constant attention to oil cleanliness is necessary.

Consultations have been held with the manufacturers in an attempt to eliminate foreign matter from the systems more satisfactorily but in the case of the hoist control and pilot valves, it is clear that further action is required. Trials have now been completed on modifications that include the fitting of sintered bronze filters in the supply leads to the valves, increases in clearances between working parts, and changes in dimensions that will increase upward

pressure bias on the pilot valve. One effect of the latter modification will be that if such failures do recur the pilot valve will tend to seize in the ' up ' position : this is considered preferable to seizure in the ' down ' position, as the latter causes the hoist to continue feeding even though there is a shell or cartridge at the top, consequently endangering the operator who is trying to remove the round from the hoist. The modifications are being incorporated in equipments as soon as the necessary parts are available.

In the meantime, instructions have been issued for frequent examination of these valves.

Spare Gear, Containers for Silicone Fluid—H.M.S. ' Lynx '

There has been considerable seepage from tins of silicone fluid held as spare gear for Mark 6M Directors. After one year in the ship, the two cans originally supplied were completely empty, and two further cans supplied as replacements were found on receipt to be 25 per cent deficient. The screwed caps for the containers were tightly secured.

The seepage seems to have taken place either past the screwed caps, or through the soldered joints of the cans.

Comment

It seemed at first that there may be some possibility of chemical action between the silicone fluid and the lead in the solder for the joints. However, further stocks of these containers were examined, and no seepage had occurred after considerable periods in store.

It was noted that the containers were of rectangular cross-section and, being made from tin plate, would not stand rough handling. It seems most probable that the containers supplied to H.M.S. *Lynx* were roughly handled in transit, and (as there is no known way of preventing this) arrangements have been made for further supplies of the fluid to be provided in cylindrical containers of more robust construction.

Director Aimer's Binocular Sight—H.M.S. ' Puma '

Vision through the trainers sight in the Mark 6M Director was blurred. On inspection from the outside of the director, a white film could be seen on the inside of the windows. It would seem that the cadmium oxide film used for heating the window is defective, although heating arrangements are still effective.

Comment

Investigation in the ship showed that the film was caused by water vapour, and that a thorough desiccation of the sight removed most of the blurring. However, measurement of the resistance of the heater coating, which should be between 150 and 175 ohms, showed that it had risen to 2,000 ohms. It is considered that this defect was caused by the water vapour.

Although there may have been a major air leak in the sight concerned, it is appreciated that the original desiccation arrangements for the sights are inadequate, and continuous automatic desiccation will shortly be fitted. It has also been found that there are difficulties in manufacturing a stable heater coating, and experiments are being conducted to find a more satisfactory form of heating.

4·5 in. Mark 6* Mod. 1 Mounting, Ammunition Hoists—H.M.S. ' Salisbury '

During firing exercises, one of the shell hoists on the revolving structure of

the mounting fed two shells during one stoke. When the defect was investigated, the operation of the hoist was satisfactory and double feeding could not be reproduced. It was assumed that the upper fixed pawl had not engaged properly under the first shell, allowing it to slide back down the hoist until its base rested on the nose of the shell below it.

Some days later further double feeding occurred. A more thorough examination of the hoist showed that at the top of the delivery stroke the fixed pawl operating lever did not engage with the cam, so that the fixed pawls were only returned to the ' out ' position by the auxiliary springs. The cause of this was bad adjustment of the position of the lever. The sporadic nature of the double feeding was attributed to the fact that the auxiliary springs operated satisfactorily on some occasions, but were not quite quick enough on others.

Comment

Two reports were received of these incidents. At first, it was thought that the double feeding may have been caused by failure of one of the moving pawls, as this had occurred in other ships when the heel of the pawl had struck the operating spring casing with sufficient force to cause distortion of the casing and thereby the sticking of the pawl in the ' in ' position. This is not possible on the fixed pawls. On receipt of the second report, it was clear that the fault was as stated by the ship.

The design of the moving pawls is, however, being modified. The modification will only be applied in equipments of new manufacture, unless failure of pawls in existing equipments justifies retrospective action.

Air Look-out Sight, Magslip Adjustments—H.M.S. ' Salisbury '

The training transmitter box on the Air Look-out Sight, Type T.274, is very inaccessible, and to enable the transmitters to be ' racked ' a special key is provided and can be inserted in any one of four holes in the top of the box. This is intended to avoid removal of the seat and gear attached to the training path.

However, it is necessary to undo four keepscrews before racking a magslip element, so that the aim of simplifying maintenance work has not been achieved. It is suggested that the cover-plate for the transmitter box be split in two, so that each half may be removed individually without stripping the rest of the sight.

Comment

It is accepted that the aim of simplifying maintenance had not quite been achieved, but not for the reasons stated. In fact, the clamping nuts for the magslips in this transmitter box are fitted with spring washers, so that the magslip bodies can be turned without slackening the nuts. Thus the cover, seat, etc., need not be removed when adjusting the magslips. This information is given in handbooks for the equipment, but unfortunately, owing to delays in printing, this book has only recently become available for distribution.

Gyro Air Supply Unit, Cooling Fan Blades—H.M.S. ' Chichester '

Two blades of the fan for cooling the air compressor were found to be cracked at the root right-angle bend. One crack opened to such an extent that the blade fouled the driving belt. It is considered that these are fatigue fractures and that more attention should be paid to stresses set up in the blades during manufacture.

Comment

Other ships have reported similar troubles, and have in some cases criticized the design of the fan. It is considered that H.M.S. *Chichester's* suggestion that manufacturing processes are the cause of the trouble gives the key to the problem, and investigations are being made into the practicability of relieving the stresses set up when bending the sheet steel to form the blades. In addition, the radius of the bend is thought to be unnecessarily small.