NOTES FROM SEA

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

Rounds and Eductors

A frigate towards the end of a period in dockyard was completing preparations for raising steam. The firemain had been connected to a shore hydrant.

When turning-to for the forenoon it was discovered that the boiler room had been flooded to a depth of about three feet above the plates. The water was fresh.

After removal of the bulk of the water, the cause was quickly established to be a leak from one of the two fitted eductor systems.

The overboard discharge valve had been closed correctly after last being used, but the supply valve from the firemain had been left open. The bilge suction non-return valve was almost certainly held open by some debris because subsequent trials established the effectiveness of the non-return action. The low shore firemain pressure would also have contributed to a slow flood without washing back any obstruction under the valve lid.

Non-observance of the correctly laid down rounds routine and incorrect operation of the eductor system combined to produce another expensive and unnecessary flood.

A Difficult Fire-fighting Situation

A frigate lay secured to buoys at four hours' notice. Both boilers were shut down and all electrical power was being supplied from two Diesel generators located in one compartment. Both machines were under the control of their individual automatic watchkeepers.

During the middle watch, one of the fuel injection pumps barrel locking screw became loose and finally worked itself out of the body of the pump. This immediately flooded the top of the engine with dieso, as the supply pump continued to deliver fuel at about 15 lb/sq in.

The exact cause of ignition is not known, but the proximity of the hot exhaust manifold and the presence of electric circuits probably both contributed. The fire developed rapidly. In a short time the automatic watchkeeper shut down both generators, thus depriving the ship of all electric power and hence firemain.

Fortunately, as ventilation ceased and the supply of further fuel was cut off when the Diesel stopped, the fire was effectively starved. Nevertheless, the only major fire-fighting appliance remaining was the portable Diesel fire pump. This pump was connected to the firemain and boundary cooling was effected; the diminishing fire was successfully extinguished with first aid appliances.

A Split FFO Tank that should have been Avoided

The standard method of refuelling a frigate where a combined filling and suction line is fitted involves isolating the tanks being used to supply the boiler, from those being refilled. The tank valves are capable of both flood and non-return action.

It is sometimes necessary to change over the tanks in use during the operation in order to complete the final stages of the fuelling.

A case occurred recently in which it became necessary to use, as stand-by for the boiler, a tank which had just been filled. The tank valve which should have been closed from the flood to the non-return position was not operated correctly. This left the tank connected to the suction/filling main; overfilling and pressurizing of the tank occurred.

Damage to a Large Diesel Engine

The exhaust valves of one cylinder unit of a large Diesel engine were found to be tight after the discovery of extensive damage to the valve operating gear.

The valves were freed and the damaged gear replaced but the cylinder head was not lifted. The engine was run up on the completion of repairs and reported as correct.

When next at sea the repaired unit was found to be not firing and after extensive investigation the connecting rod was found to be bent and the piston skirt damaged.

Comment

In the event of damage to any part of an engine it is essential to fully examine all associated parts.

Turbo Generator—Armature/Gearing Alignment

Replacement of a defective turbo generator armature resulted in heavy vibration of the machine when the first trial run of the machine was made.

Subsequent examination of the main reduction gearing revealed serious mis-alignment between the main wheel and the pinion with heavy bearing marking. The armature/main-wheel mating flanges were found to be out of truth with each other. Damage to gearing and bearings was fortunately avoided by the prompt shut down of the machine when the vibration occurred.

Comment

The importance of careful dimensional checks of replacement items before fitting cannot be over-emphasized.

Boiler Contamination—Type 15 Frigate

As part of the Marine Engineer Officer's supersession inspection, the boilers of a Type 15 frigate were opened for internal examination.

Inspection revealed considerable contamination and some evidence of scab pitting. Examination of these deposits by a Dockyard laboratory found them to be a combination of oil and iron oxide, in the form of rust and scale, subsequently baked on to tubes and drums. During subsequent cleaning of the boilers the use of bullet brushes was found to be ineffective and the tubes were eventually cleaned with flexotube equipment.

Examination of all feed tanks showed a large accumulation of scale/rust deposits in the bottom of each and grease filters were found to be inadequately packed. As a direct result some oil and scale must have been introduced into the boilers in the normal course of operation.

Comment

Inattention to recognized practices for the treatment and maintenance of cleanliness and purity of feed water was all too clear.

Total Electrical Failure

The most effective peace-time method of rendering a D.L.G. at sea completely non-operational is to initiate a total electrical failure. This has happened at least three times during the last two years resulting in disruption of tuned weapons systems and mandatory bearing inspections.

On two occasions the loss of power resulted from an attempt to parallel a failing generator with the only remaining running set.

Moral

Never attempt to parallel one generator with another known to be failing. The danger of out-of-phase synchronization and subsequent total failure far outweighs the embarrassment caused by the loss of some supplies. Let the failing machine shed its load. The automatic change-over devices will ensure continuity of essential services and allow the board to be made up while additional generators are started.

Seeing is Believing

Although the turbo-driven forced lubrication oil pump was running at the correct speed the *Daring* had been plagued by a low discharge pressure since refit.

Diagnostic expertise was brought to bear by each subsequent authority as the ship passed from refit to being operational, but even after giving the pump end a further refit its performance was not improved and the motor-driven pump was required to back up the pressure even at low shaft revolutions.

Then someone counted the teeth of the governor/tachometer drive gearing and found that extraction pump gears had been fitted in error giving a low pump speed in relation to the correct tachometer reading.

Moral

Don't always accept things at their face value.

Economizer Failures

The economizers of a ship recently required renewal after less than one year's service. The excessive wastage rates were caused by 'cold feeding'.

Modern boiler designs are based on a requirement for the economizers to be fed with water at approximately 240 degrees F. If the feed water at the economizer inlet is maintained below this temperature the funnel gas temperature will fall below the dew point and the onset of dew point corrosion will be rapid and severe—as was.

Failures in Main Boiler Pipe Welds

A weld failure occurred in the feed pipe between the economizer and the steam drum in an aircraft carrier. Radiographs of other welds in economizer inlet and outlet pipes and in the boiler steam piping showed that a large proportion was suspect.

Comment

The welds were all of the backing-ring type which is no longer an approved method for welding pipes of this size. The defects were thought to have been caused by crack propagation from the root of the weld at the notches made where weld metal fused into the backing ring.

The welds were repaired using a consumable insert of the Grinnell type.

Slack Propellers

A routine underwater inspection of the propellers of an aircraft carrier showed that in two cases a large gap was present between the nut and the propeller boss. In one case the gap was more than an inch. The securing pins were intact, so it is assumed that the propellers had not been hammered up securely when fitted ten months previously and had subsequently worked up the shaft when the engines were steamed ahead.

Comment

These are very large propellers, 15 ft 6 in. in diamter, and are difficult to hammer up effectively, although this is the first time such a considerable failure has occurred. An improved method using a Pilgrim nut, which has a built-in hydraulic jack, is under investigation.

Failure of Rear Wall Boiler Brickwork

The rear wall brickwork in the Admiralty three-drum boilers of an aircraft carrier was renewed during a refit. Subsequent high power steaming showed that the rear casings were overheating. Temperatures of 700–800 degrees C were reached. These hot spots were associated with the two brickwork expansion gaps which had not closed up during initial firing.

Comment

The expansion gap may have been too wide in the first place or the brickwork may not have been adequately fired at low powers. However, the brickwork design was poor in that one thickness of insulating brick behind the gap was replaced by refractory brick.

As an interim measure, the bricks were replaced by plastic refractory secured by ceramic keys in the area of the expansion gaps. Allowance for expansion was made only by a knife-cut in the plastic. This repair proved satisfactory in preventing overheating of the casings but more permanent redesign of the brickwork is being carried out.

Failure of Superheater Tube

A superheater tube in an aircraft carrier three-drum boiler failed through local overheating. Subsequent examination revealed that the tube contained a heavy build-up of soluble deposits of phosphates and chlorides in the area of failure.

Comment

Immediately before the failure the boiler concerned had steamed at about 90 per cent power for several days and compounding carried out during the period had little or no effect on the alkalinity. It was thought that heavy carry-over must have occurred and that the problem would be solved by reducing power when compound was added to the boiler. However, subsequent trials showed that continuous carry-over of from 3 to 4 per cent was still taking place at high boiler powers. This is as compared with an acceptable limit of 0·5 per cent.

The internal gear seems to be in a satisfactory condition, so additional baffles are being fitted in the steam drum of one boiler for trial to see if the carry-over can be reduced.

Note: It may be wondered why this failure has not occurred before, since the boilers concerned are of ancient design. Normal full engine power is, however, achieved with only about 70 per cent boiler power and the incident above occurred during high power steaming on one out of two units, while the other was being maintained at sea. This particular situation had not previously arisen.

Catapult Track Cover Corrosion

Probably one of the heaviest loads imposed on ships staff and dockyard sections concerned with the maintenance and refit of steam catapult machinery has been the problem of removing BS4 catapult track covers.

Track covers manufactured from 28–33 ton/sq in. UTS steel and support rails of the same material, of necessity are mated together with clearances not exceeding 4–6/1000 in. and for economic reasons neither component has been manufactured from corrosion resistant materials.

Following relatively short periods in service, severe corrosion of catapult track covers and support rails had frequently led to seizure of the mating parts and the necessity of using near destructive force to achieve separation.

Earlier attempts to eliminate or reduce the problem by the application of varying types of grease and anti-seizure agents had been largely unsuccessful due to the severity of the environmental conditions whereby the units were exposed to sea water, steam, aviation fuel and strong detergent solutions such as Slix, used during deck cleaning following aircraft fuel spillages.

Physical separation of the covers from the support rails by means of a 0·004 in. polythene sheet was tried in H.M.S. *Ark Royal* but resulted in misalignment of the tracks affecting the operation of closely toleranced moving parts.

The Devonport Dockyard Laboratory who had been taking an active interest in this problem carried their investigations further and with D.G. Ships' support decided to repeat the technique of fitting an insulating membrane between the mating parts, limiting the film thickness to 0·002 in. and additionally preventing access of flight deck effluents by sealing the covers and retaining bars at their junction with the flight deck.

Reduction in film thickness carried with it a requirement to find a polyester type material with good heat resisting and high strength qualities. Melinex 'S', manufactured by I.C.I. Ltd., met these requirements and had the added advantage of being available in strip form and a thickness range of 0·00025 in. to 0·0075 in.

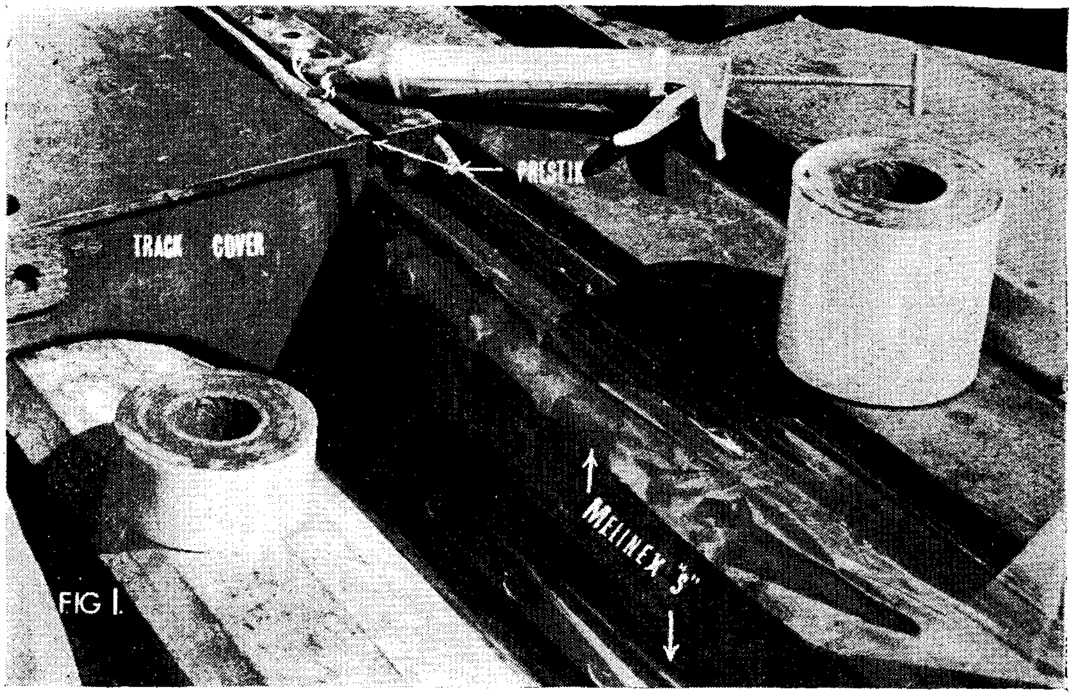

FIG. 1

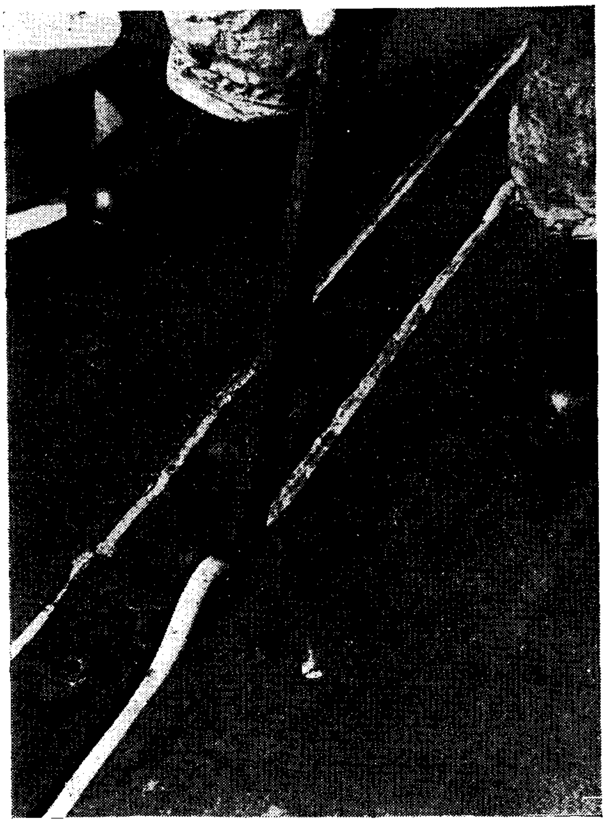

FIG. 2—CAULKING REMAINING GAP BETWEEN RETAINING BAR AND FLIGHT DECK

The upper and lower support rails and corresponding surfaces of the track covers were cleaned with white spirit and liberally coated with molybdenum disulphide grease. Polyester film 6 in. wide for the upper rail and 3 in. wide for the lower rails, was placed in position and the covers carefully lowered and located (FIG. 1). Prestik sealing strips of flat and round sections were used to seal the gaps between the track retaining bars and the flight deck being finally caulked and topped with gum mastic in order to prevent the ingress of flight deck spillages (FIG. 2).

Following long periods of use this method of protection has been completely successful and reduced the ship and dockyard workload considerably.

It is now possible to lift a complete row of catapult track covers in a day whereas it has been known for a single 6 ft length cover to take two to three days, stubbornly resisting the efforts of flight deck jumbo and 50-ton jacks.

Acknowledgement is made to the Dockyard Laboratory Devonport for the major part of these notes which have been extracted from C.D.L. Report, Devonport N.676.

APPENDIX—MATERIALS AND PROCEDURE

Material	*Product Name*	*Manufacturer*	*Chemical Resistance*	*Heat Resistance*	*Characteristics (Manufacturer's data)*
Molybdenum Disulphide Grease	Rocal M.T. 265	Rocal Ltd. Pattn. No. 943–5281		M.P. 220°C	Water repellant, can be operated continuously up to 175°C with intermittent exposure to 205°C
Polyester Film	Melinex 'S'	I.C.I. Ltd.	Good resistance to oils, fuels, water, detergents	M.P. 265°C	Good slip characteristics. Low water absorption Low expansion 27×10^{-6}. Good dimensional stability.
Sealing Strip	Prestik No. 5806	Bostik Ltd.	Good resistance to oils, fuels, water, detergents	Remains flexible −20°C to 100°C	Suitable for joints subjected to movement and vibration.
Sealing compound	Gum Mastic	Bostik Ltd.	Expendable material intended to give limited protection to sealing strips.		

Knoates from Sea

'Knoates is back again from sea, Sir.'

'Knoates, N. B. Knoates', exclaimed my Assistant Director. 'He was Chief of that Type 88 about a year ago, wasn't he?'

'Yes, Sir. They went to Tipperary and demanded a replace feed pump to be sent to them there. He wanted it the same day; didn't realize how far it was to Tipperary.'

'What was the final outcome?'

'Well Sir, we sent it to Timbuktoo, and he met up with it there. But we had trouble in getting the old one back. He signalled that he had landed it at Devonmouth on his return to U.K., but the Yard denied all knowledge of having received it.'

'I remember now', said the Assistant Director. 'Did we ever trace that pump?'

'No Sir, but I have found out what happened. The ship put into Devonmouth just for a few hours and the Chief landed the pump onto the jetty, but couldn't find anyone to sign the 331 or accept the crate from him. So he made the usual signal to A.S. about having landed it at such and such a jetty at 0700 on a dark, wet morning.'

'How did you find out all that?'

'Knoates came to see me yesterday, Sir. He said that he thought that it was about time that MOD(N) had an organization set up in each Yard to deal with Depot Spares in transit. I was able to tell him that we have done just that; and that the Depot Spares Transit Stores in each Yard will be in operation by the time I can get this printed in the *Journal*.'

'Excellent.'

Deltic Engines—Failure of Starter Cartridges

In a coastal minesweeper, a number of Deltic engine starter cartridges failed to fire. The batch was returned to RNAD, Crombie, where they were checked and proved to be within specifications. DGW(N) was of the opinion that the breech mechanism was at fault but the ship stated that the breech had just been overhauled and the firing circuit checked.

Comment

This is not an isolated case, and enquiries have been made to try to determine the cause of cartridges failing to fire. It is observed that BRs 994 and 996, and TPs 56 and 57 allow the use of a spent cartridge instead of the correct test plug at certain stages of testing the firing circuit. It seems likely that this introduces inconsistencies of settings, and it has been decided that in future only the special test plugs, Adrefnos 673/074021 and 673/074022, be used in these tests. The BRs and TPs are being amended accordingly.

Reports have also been received that the cause of failure of starter cartridges to fire has on occasions been the replacing of the electric leads the wrong way round, and the presence of earths on the associated Foden starting battery circuit.

Deltic Engines—Failure of Fuel Rack Control Linkage

An Australian coastal minesweeper suffered a failure of the starboard Deltic engine, resulting from the failure of the fuel rack control linkage and consequent overspeeding. After increasing shaft revolutions from 350 to 400, the speed of the starboard engine was observed to be increasing beyond the speed set by the Controls. Winding back on the control wheel failed to have any effect and the engine speed increased to 1700 crpm. In his attempt to reduce the speed, the watchkeeper is reported to have slected 'neutral' on the control wheel for a short period. The Chief ERA, when summoned by the watchkeeper, confirmed that the controls were ineffective and, observing that the speed was continuing to increase, attempted to shut down the engine by shutting the air intake valve. This did not have the desired effect due to air leakage past the valve and probably the collapse of the flexible part of the air inlet duct.

At this point the bridge, noticing clouds of smoke from the funnel, ordered the engines to 'slow', and then 'stop'. The port engine was accordingly stopped and the starboard engine slowed down due to the additional load of driving the ship. However, its speed rose again to 1800 crpm before coming to a stop by seizure.

Subsequent investigation showed that the linkage between the governor output lever and the fuel rack control lever had become disconnected, and that the fuel rack was thus free to move to a setting of 150 degrees—well over the normal full-power position.

Comment

Although this is an isolated case, it draws attention to the serious situation possible when the control linkage becomes disconnected. Because this is considered to be unacceptable, action has been taken to introduce a modification on Deltic engines incorporating a fuel rack spring return which will cause the rack to return to the minimum fuel position in such a situation.

The lessons to be learnt from this incident are the importance of checking the security of the control linkage at regular intervals, and the danger that until the new modification is incorporated, such a failure of the control linkage makes it possible for the clutch to be disengaged by the watchkeeper while the engine is at full power. The manufacturers consider that this action would be so disastrous that it cannot in fact have occurred in this incident.

Are Your Evaporator Pumps Really Necessary

On 22nd January, 1968, H.M.S. *Eskimo* sailed from Bahrain for a round trip scheduled to take 33 days. Twelve days out of Bahrain the after evaporator circulating water pump motor burned out.

A few signals soon established that no spare was immediately available and arrangements were made to supply circulating water from the firemain. This was achieved by producing suitable adaptors to fit the system, supplying water from the nearest hydrant.

On 15th February, disaster struck again—the element drain and brine combined pump motor of the same evaporator burned out. It was clear that, even supposing a spare was available, there was little hope of getting it to the ship before returning to Bahrain. The modest performance of these evaporators, even under favourable conditions, did nothing to improve the prospect of a ten-day passage on one unit.

The question of rigging temporary systems was discussed with the senior staff of the Department and it was decided that the element drains could be run to the auxiliary boiler feed tank, provided the plant was run on saturated steam, and thence to the reserve feed tanks. Accordingly, the after drain cooler inlet to the auxiliary feed tank was removed and the connection fitted with a flanged stub pipe. The element drains were fitted with a similar arrangement and a rubber hose provided between the two, readily removable for discharge to bilge during the flashing-up phase.

This left the problem of brine removal. The only 'vacuum raising' equipment readily available on board was a portable DC eductor, and a bit of clever adaptation by the CERA (a coppersmith) soon produced a fitting which bolted directly onto the brine outlet flange. First trials, using the fitted brine system, were disappointing and ultimately the eductor had to be used with a simple hose discharge to bilge, the main eductor being used by the watchkeeper to clear the bilges.

The port side of the gearing room is now a maze of hoses and the set a mass of pipes and varied adaptors—but the evaporator is making good water under conditions closely approximating design figures.