CORRESPONDENCE

SIR,

Spill Combustion Systems Hazards—and the use of the Column Recirculating Valve

I read with interest the above 'Note from Sea' in Vol. 19, No. 3, as it brought to mind some trials I did at AMEE (then AFES) in 1965. These were aimed at using the phenomenon of 'super-simplexing' (or augmenting) to get a high output from spill burners at low fuel pressures without resorting to assisted atomization.

AFES Technical Memorandum No. 13/65 of August, 1965, which reports these trials did not recommend the adoption of this technique but it contains an interesting Appendix:

'*A Disquieting Aspect of Super-Simplex*'

'An interesting but alarming thought when considering super-simplex is that in current spill system installations where a recirculation connection and valve link the supply and spill manifolds, if the valve is left partially open, or if it leaks, super-simplexing can occur when the spill valve is shut. With the boiler combustion in automatic control it would also be necessary for the spill pressure transmitter to be slightly out of calibration (e.g., giving an output of 26·7 psi instead of 27 psi for an input of 900 psi), or for the spill pressure controller to be slightly out of balance, but these are quite common occurrences. The result of this uncontrolled super-simplex at high powers would be either extreme over-forcing of the boiler, or a breakdown of the spray and flame'.

(*Sgd.*) M. F. GRIFFEY,
(*Ship Department*)

SIR,

Gross Contamination of Fuel in a Y.136 'Leander'

Under 'Notes from Sea' in the *Journal*, Vol. 19, No. 2, appears an item entitled 'Gross Contamination of Fuel in a Y.136 *Leander*'. This appears to be a condensed version of the report made following an incident in H.M.S. *Sirius* after fuelling from a fuel lighter at San Juan, Puerto Rico, in May, 1970. There are a number of errors of fact in the report and, in the light of information obtained subsequent to the report, I believe the conclusions to be incorrect, as indeed I did at the time.

The ship fuelled with gasoil from a U.S. Navy fuel lighter on 6th May, 1970, the original source of the fuel being the Shell Oil Company. Before fuelling, all tanks in the lighter were sounded using water-finding paste, samples were obtained from the lighter and a sample was taken at the fuelling goose-neck when fuelling commenced. All soundings and samples appeared to be satisfactory. The specific gravity of the fuel was not measured.

Steam was raised for auxiliary purposes on 12th May and the ship put to sea on 14th May. On 15th May there was a flame-out in the port boiler. This occurred while fuel was being transferred to the port service tank. Testing at the test cock showed the presence of water and, despite persistant stripping, water was still appearing at the test cock when the tank was down to 16 tons, at which point the test cock ceases to operate.

In the meantime the port boiler was changed over to No. 6 main storage tank suction, purged and put on load. A most careful test was made of all storage tanks, using water-finding paste, but revealed no contamination. Because no further tests could be made from the port service tank and the

stripping tanks were full of what was tested as uncontaminated fuel, the decision was made to pump the remaining 16 tons in the port service tank overboard. Samples taken at the hose end showed gross contamination of the order of 50 per cent.

When the service tank was empty, fuel was again transferred from storage to the port service tank. At 16 tons the test cock again showed contamination. This fuel was jettisoned and a check was made to ensure that bilge water was not being drawn into the system. Only one valve is involved; this valve was checked shut and was subsequently proved to be tight. A physical examination was also made of the pipe runs.

When further attempts to transfer fuel to the port service tank only resulted in contamination showing at the test cock, no matter from which storage tank it was drawn, the Captain was advised that it was necessary to return to harbour for a more complete investigation.

During the foregoing events the port fuel service pump supplying the port boiler from No. 6 main storage tank started to slam. No. 6 tank was at about 50 per cent when this occurred. The tank was topped up and the slamming ceased. The boiler did not flame out.

On arrival at Key West the ship was de-fuelled. Inspection of the port service tank showed:

(*a*) That the test cock tail pipe terminated $\frac{1}{4}$-inch from the bottom of a coffer dam formed by the ship's frame which could not be emptied by the stripping pump and hence tests from this cock were not representative of the tank contents.

(*b*) That the stripping pump suction elephants foot was partially detached and hence the bottom 4 inches of the tank could not be pumped out.

(*c*) That the service pump suction terminated a nominal 4 inches above the tank bottom but in such a way that a slight list to port brought the suction to its lowest point.

(*d*) That the configuration of the pipework is such that the service pump will not take suction below about six feet. This has not been verified by experiment.

(*e*) That the configuration of the pipework is such that the service pump will not take a satisfactory suction from No. 6 main storage tank when the tank is below 50 per cent.

No reason could be found for the undoubtedly gross contamination which occurred.

On the next occasion of fuelling at San Juan, fuel was offered from the same lighter as on the previous occasion. Before accepting fuel a 'thief's bottle' was obtained and bottom samples were taken. All the usual tests showed the fuel to be acceptable but some of the bottom samples were extremely dirty and contained a large proportion of a clear liquid. This liquid separated out quickly from Dieso, was non-flammable and did not react with water-finding paste. It has not been identified but may possibly have been some form of tank cleaning fluid. Almost certainly this was the source of the contamination experienced after the last fuelling at San Juan.

A number of valuable lessons were learned from this incident:

(*a*) It is possible for contamination to occur from the bilges while transferring fuel, although this did not occur in this case.

(*b*) When separation occurs in a fuel sample the separated liquid may not be water. The investigation was bedevilled in this case because the samples taken from the service tank coffer dam via the test cock did in fact contain a proportion of water and therefore showed a reaction with

water-finding paste. Tests with water-finding paste were not made at the hose end while jettisoning fuel.

(*c*) The normal methods of handling and testing fuel are inadequate when dealing with contamination of this nature and magnitude.

(*d*) In this ship, and presumably in other *Leanders*, the main fuel pump suction tail pipes could well terminate 4 feet above the tank bottom instead of the regulation 4 inches without loss of usable fuel.

(*e*) Similarly, No. 6 storage tank cannot satisfactorily be used as a stand-by tank below about 50 per cent; nor, by experiment, will the service pumps take a satisfactory suction from the auxiliary storage tanks.

It is understood that action is in hand to provide 'thief's bottles' for use when fuelling from shore or lighter and which may also be used through the usual fuel tank sounding tubes.

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