CORRESPONDENCE

SIR,

Steam Installations

In his article ' Steam Installations ' in Vol. 7, No. 1, of the *Journal*, Commander (E) Hollamby states that ' the Engineer-in-Chief's problem is to provide the lightest, smallest and most economical machinery and equipment to meet Fleet requirements '.

Is this really stating first things first ? Destroyers now in service, have lighter machinery than that of their predecessors, but in nearly every Class, after a few years in service, either the amount of fuel oil that can be used has been reduced or the engine room bilges have been fitted with useless pig-iron ballast. Thus, while light machinery may be commendable, it seems that E.-in-C. in his quest for lightness has run foul of D.N.C. in his quest for stability.

Judging again by ships in service, the priorities listed later in the same article should be replaced by the following in this order of importance :—

(*a*) Reliability.

(*b*) Simplicity of construction.

(*c*) Ease and cheapness of manufacture.

(*d*) Ease of maintenance and replacement.

(*e*) Efficiency of performance and economy in consumption.

(*f*) Ease of operation.

If, as is suspected, modern machinery is more complicated, more difficult to maintain, and less reliable than its ancestors, is it possibly because too much energy has been devoted to saving weight and space and increasing the efficiency of the installation at the expense of more urgent priorities ?

(*Sgd.*) P. A. TURNER,
Lieutenant-Commander (E), R.N.

SIR,

In the conclusion of the above article in Vol. 7, No. 1, of the *Journal*, the author states :—

> 'A big step forward is now being made in the design of steam machinery for H.M. ships.'

I am at a loss to understand how the author arrives at this conclusion, as apart from making use of the better facilities now available, I fail to detect any difference between what is being done now and what was done in the past.

The Yarrow-Admiralty Research Department was not formed until well after the war, previous to that time E.-in-C.'s officers were forced to make decisions on the evidence available, which was often scanty. It is therefore of interest that, with very few exceptions, the decisions so made appear to have been supported by more detailed design study.

One such exception is the decision to use the de-aerating feed tank instead of a pressure feed heater. This change was considered for *Daring* Class ships but turned down largely, I believe, because the advantage was thought to be doubtful and so many changes were being made in these ships already that a change in this respect was not considered wise.

It would appear to me that the main advantage of this system, which involves of course the need to bleed saturated steam when exhaust supply is low, is of easier control, since the evaporator can be worked on exhaust steam with confidence. I do not believe that this is the only way of achieving this desirable end.

From a heat balance aspect I suggest the case is marginal and depends upon one's assessment of such variables as the inclination of a ship's company to wash and the method of working auxiliaries as well as the ship's cruising power. It is by no means fair to assume that 20 gallons per man per day is a constant demand for fresh water, as those who experienced Northern Patrol duty will recall.

The author's assertion that present practice is to keep lubricating oil temperature at 90°F leaves me puzzled, as according to my information, the instructions have called for 120°F since 1948.

The author's contention regarding circulating water flow that ' Probably the best compromise is to use the scooping effect at cruising power and boost the water flow by means of a pump at higher power ' requires some qualification. If he means by some sort of injector principle using a high pressure pump, I accept his contention. If, however, he means by reverting to older practice of placing the circulator in the main stream, I would remind him that in ' Battle ' and ' Emergency ' destroyers the effect of the circulator at high power is to reduce the cooling capacity of the condensers, not the reverse.

(*Sgd.*) E. G. SUTTON,
Commander (E), R.N.

SIR,

It is indeed stimulating to get some reaction from your readers, but very difficult to reply briefly to their queries.

As regards Lieutenant-Commander (E) Turner's letter, he asks ' Is this really stating first things first ? ' Surely the first thing is undoubtedly that ships of the Fleet should have the maximum fighting potential. For modern destroyers the total weight of propulsion machinery and fuel oil carried amounts to between 40 per cent and 50 per cent of the ship's deep displacement. It can readily be seen that after due weight allocation has been apportioned to the hull, electrical and other fittings, the remainder available for fighting equipment is small.

The challenge to the engineering community is clear. Every ton of machinery or fuel weight that can be saved and transferred to fighting potential is surely putting first things first.

Neither does it follow that light weight machinery intensifies the D.N.C.'s ever present stability problem. On the contrary, light compact machinery will in most cases have an inherently low C.G. and give scope for lowering the deck head above the machinery space with the consequent beneficial lowering of top weight. There is always a margin of stability in a new ship to allow for subsequent A.s and A.s, which in an old ship may necessitate top-weight compensation by fitting pig-iron ballast in the bilge or elsewhere.

Reference to a priority list is not understood as the listed special requirements were not in any order and it was clearly stated that the best compromise must be worked out.

Commander Sutton seems to be under the impression that E.-in-C. officers do not now make the decisions. This is entirely wrong but the evidence on which they now make their decisions is no longer scanty. While all constructive criticism is valuable, it should be realized that the decisions on deaerators, heat balances, and circulating water flow were made by E.-in-C.'s officers after consideration of the best available information.

The work of the Research Department is principally concerned with detailed investigation into the most suitable combinations of boilers, engines and auxiliaries for future ships, taking into account new problems brought about by such things as A.B.C.D. warfare. As with most research work, the security grading precludes publication and therefore the field for an article on the subject is very limited.

(*Sgd.*) A. E. HOLLAMBY,
Commander (E), R.N.

SIR,

Notes from Sea—Feed Regulators—H.M.S. ' Newcastle '

The opinions expressed regarding hunting of boiler water levels are unlikely to satisfy all readers of the *Journal.*

By a lucky chance I turned up No. 16 of *Papers on Engineering Subjects* of December 1937, and quote from an article therein entitled ' Naval Water Tube Boilers ' (pages 39–42).

' *Operation of Boilers.*—The effect of a considerable increase in the feed supply is temporarily to retard the generation of steam and to increase the density of the mixture of steam and water in circulation in the boiler. As a result, the water level in the gauge glass does not rise as would naturally be expected due to the increase in feed supply, but falls, and more feed water is supplied in order to maintain the water level. This causes a temporary reduction in steam pressure. Exactly the reverse happens when the feed supply is reduced considerably, and the water level rises temporarily instead of falling, with a result that a further reduction in feed is made to meet that condition, with consequent rise in steam pressure.

These large changes in the feed supply produce very unsteady boiler conditions which result in undesirable changes in steam pressure and unsteady working of the machinery. These changes in conditions can be avoided if the changes in feed supply are made gradually.

Automatic Feed Regulators.—It is, therefore, very important that the automatic feed regulator should be thoroughly reliable and should give a steady control of the feed supply without overfeeding or underfeeding, as any tendency of the feed regulator to feed intermittently or to ' hunt ' becomes exaggerated by the action of the boiler.

It is the usual practice in naval vessels to heat the feed water in pressure feed heaters on the discharge side of the feed pumps, where the heating agent is the exhaust steam from the auxiliary machinery. The auxiliary exhaust steam is condensed in the feed heaters, and if the feed supply is unsteady the rate of condensation of the auxiliary exhaust steam will be unsteady and the pressure in the auxiliary exhaust will fluctuate. This fluctuation in the auxiliary exhaust pressure causes unsteady working of the auxiliary machinery, particularly when working with the closed feed system, and produces unsteadiness in the supply of air to the boilers and interferes with the action of the feed system, and, in many cases, makes the boiler plant very difficult to control. The need for a high standard of steadiness of control by the feed regulator, is, therefore, of primary importance.'

Let us consider what is required of the feed regulator in order to achieve a high standard of steadiness.

(*a*) *Increasing ouput from the boiler.*—In this case feed to the boiler will eventually require to be increased but first, a pause should be dwelt while the water in the boiler which is surplus to requirements of the new state, is boiled off.

(*b*) *Decreasing output from the boiler.*—Feed must eventually be decreased but first the additional quantity of water required for the new steady state must be fed to the boiler. It is important that this make up shall not be carried out so quickly that the exhaust system is seriously affected.

Neither of the conditions is met by a feed regulator controlling from water level alone. In case (*a*) instead of dwelling a pause the regulator immediately cuts down the feed and subsequently gradually increases it until the new state is reached.

The effect of the cut down of feed is further to raise the water level and that of the first flush of feed water is to depress the water level suddenly and thus to superimpose a hunting or unstable condition on the transient response.

In case (*b*) the trend is right but there is no check to the rate at which the additional quantity is made up. The hunting condition is submerged by the first reaction but may appear later.

The hunting condition may appear at any time during ' steady steaming ' due to an otherwise unnoticed disturbance. It may itself go unnoticed if the rate of feed is small, or it may be suppressed if sufficient damping is available.

Consider the case of the feed regulator controlling from rate of steam outlet combined with a proportion from water level.

Case (*a*) may be met depending on the proportions of each control. Increase in steam flow will cause an increase in feed flow, rise in water level will cause a reduction. These two may not precisely cancel, but the result will tend towards that required, i.e., of dwelling a pause.

Case (*b*) may also be met, the reasoning being similar.

Hunting in the steady steaming condition is reduced by the attenuation of the water level component in the control (the amount or positional term). The steam flow or velocity component, is sensibly constant since variations in steam pressure will not be large. Thus the damping term which is probably a function of velocity, is increased in effectiveness and a stable system should result.

It is of historical interest that the principal reason for the development of the steam flow feed regulator was the hunting experienced in early ' Battle ' Class destroyers. At about this time the German destroyers were subjects of interest and the double term control was fitted in these.

(*Sgd.*) E. G. SUTTON,
Commander (E), R.N.

SIR,

The Training Value of Full Power Trials

Rear-Admiral (E) Given in his letter in the Vol. 7, No. 1, January issue considers that Full Power Trials should be used for training junior officers and ratings in handling machinery at high powers at the expense of such complete devotion to the records.

Unfortunately, unless the running of the machinery is adjusted with exactness and records taken with great care, the indication of the condition of machinery required by the Admiralty is not obtained, as Fleet Engineer Officers and Admiralty are quick to point out.

Moreover, Full Power Trials are quite unrealistic as a training for high power steaming in war. The engine room is in charge of the speed of the ship, a comfortable time is allowed for working up according to a careful plan to ensure that full power is reached at the appointed time. Thereafter nothing in

the ship is allowed to interfere for two hours with the concentration of the engineers on their records. Compare this with ' full ahead ' on the telegraphs in war time, by which the Captain means ' as many knots as you can give me as soon as possible,' with no guarantee that he will not ring down ' slow ' or ' stop ' without warning at any time.

The best training for this sort of thing is provided in those ships which habitually steam on one unit only, trailing the other two shafts. In these cases ' one unit full power ' is a frequent occurrence during exercises, giving a fair imitation of war conditions in machinery compartments.

(*Sgd.*) J. K. McA. Tod,
Commander (E), R.N.

Sir,

Foxhill—Fact and Fiction

As one of several Inspectors who, in recent years, have left Bath with a ' recommend ' that they should go far (to the Far East Station, in fact), may I say how much I enjoyed reading Captain Marshall's ' Foxhill—Fact and Fiction '.

One point in his summing up calls for a plea from those far from Foxhill. So often writers of letters, official as well as semi-official, forget to arrange for their letters to go East by air mail. By sea they may take up to two months to reach us ; by air mail they can sometimes be with us in four days. Many authorities at home fail in this respect, and A.F.O. 2030/53 drew attention to it ; perhaps these few lines in the *Journal* might act as a reminder.

(*Sgd.*) B. S. Padfield,
Commander (E), R.N.

Sir,

Production of Naval Machinery from 1935 to 1945

With reference to the above-mentioned article, page 181 of Vol. 7, No. 2, of the *Journal*, it is noted that Messrs. Hawthorn, Leslie & Co., Ltd., Newcastle, is classified as one of the firms ' producing turbine machinery up to a limited power per set '.

It is considered that this classification, using the present tense, is misleading, for during the Second World War Messrs. Hawthorn, Leslie produced the turbine machinery for two of the fast minelayers, H.M.S. *Welshman* and *Apollo* with 36,000 s.h.p. per set. This power per set was not exceeded by any other class of ship built during the Second World War and has only recently been exceeded in post-war aircraft carriers.

(*Sgd.*) A. F. Smith,
Commander (E), R.N.

Author's Reply

The three groups into which the makers of turbine machinery were divided in the article correspond to the original classification in the Admiralty List. This distinction between shipbuilders and engineers capable of building turbine machinery of ' all powers ' and of ' limited power ' is obsolete and should not have been used in the article.