CORRESPONDENCE

SIR,

The Conduct of Full Power Trials

Lieutenant-Commander (E) Rabbit's ' aide mémoire ' article in the Vol. 6, No. 4, October issue of the *Journal* gives a number of valuable hints on how to get the best results out of the *matériel* and equipment. Except, however, for a brief reference in the second paragraph the question of the training of E.R. personnel is not mentioned. This is, in my opinion, as important as his prime object of obtaining full power, and the best value of the training will not be obtained without some prior preparation.

High power steaming in peace-time, due to economy measures, is likely to be infrequent and it is important to avoid giving junior officers and ratings too much of the impression of the Full Power Trial being entirely a repeat of

Contractor's Trials conducted solely for the records obtained. Junior officers and ratings must be given confidence in handling machinery at high powers, and if it is always done under the direct supervision of their seniors they will never achieve this.

I am in no respect casting any aspersions on the value of the hints in Lieutenant-Commander Rabbit's article, but merely wish to emphasize the personnel side of the matter, hoping that perhaps some engineer officers with post-war sea experience may follow this up with some hints and experience of the training value of Full Power Trials.

(*Sgd.*) J. G. C. GIVEN,
Rear-Admiral (*E*).

SIR,

Tracking

I wish to point out two errors which have crept into the formulae in my article on ' Tracking ' in Vol. 6, No. 4.

The first equation in the middle of page 461 should read $\lambda\dot{\phi}$ for $\lambda\phi$, and the first equation at the bottom of page 465 should read $\ddot{R}$ for $\dot{R}$.

(*Sgd.*) M. T. USHER,
Lieutenant (*E*), *R.N.*

SIR,

Steaming on a Limited Number of Shafts

In the ' Notes from Sea ' in your issue of January 1952, the Engineer Officer of H.M.S. *Superb* states that up to 17 knots the revolutions required on two shafts are only 1·24 times those for the same ship's speed when using 4 shafts, thus differing from the figure of 1·41 quoted for this condition in an article on H.M.S. *Glasgow*—' Steaming on Three Shafts,' in your issue of October 1950. During propeller trials carried out in H.M.S. *Savage* it has periodically been necessary to steam at about 12 knots on one shaft with the other shaft trailing. Since this took place in Loch Goil it was possible to take accurate measurements of the ship's speed against r.p.m., both with one and two shafts in use. An average figure for the ratio of r.p.m. required on one shaft to that on two shafts at the same ship's speed was 1·20, thus tending to corroborate *Superb*'s figure. Thrust readings were also obtained which showed that an increase of just under 10 per cent. in thrust was required to trail the other shaft.

It seems probable that the relationship used for *Glasgow*—that Thrust $\propto$ Revolutions^2, is not justifiable unless the slip is nearly constant, as it normally is at all speeds when all shafts are in use. When one or more shafts are trailed the slip must alter appreciably.

A better criterion would probably be that the thrust exerted is proportional to the rate of change of momentum, and that at any given ship's speed the quantity of water accelerated by a propeller in a given time is constant, regardless of the revolutions, but that the velocity imparted to it is proportional to the slip. Hence, assuming that the figure of 10 per cent increase in thrust measured in *Savage* is generally applicable, if two shafts are trailing in a four-shaft ship,

the thrust required from the working propellers is 2·2 times that required from each propeller when proceeding normally on four shafts at the same ship's speed, and the following formula should hold good :—

$R.P.M._{2\text{-shaft}} - R.P.M._0 = 2{\cdot}2\,(R.P.M._{4\text{-shaft}} - R.P.M._0)$, where $R.P.M._0$ is the propeller speed at which no thrust would be exerted, i.e. $R.P.M._0 \times$ propeller pitch = ship's speed.

This simplifies to :—

$$\frac{R.P.M._{2\text{-shaft}}}{R.P.M._{4\text{-shaft}}} = 2{\cdot}2 - \frac{1{\cdot}2\,R.P.M._0}{R.P.M._{4\text{-shaft}}},$$

for *Superb* = 1·22,

or, for *Savage*— $\dfrac{R.P.M._{1\text{-shaft}}}{R.P.M._{2\text{-shaft}}} = 1{\cdot}19.$

Similarly for three shafts in use in *Superb*—

$$\frac{R.P.M._{3\text{-shaft}}}{R.P.M._{4\text{-shaft}}} = \frac{4{\cdot}2}{3} - \frac{1{\cdot}2\,R.P.M._0}{3\,R.P.M._{4\text{-shaft}}}$$

$$= 1{\cdot}07.$$

The speed of the trailing shafts should be approximately equal to $R.P.M._0$, but with a negative slip of about 2 × 10 per cent of the normal slip (22 per cent for *Superb* and 19 per cent for *Savage*) so that trailing r.p.m. should be $0{\cdot}96 \times \frac{1}{1{\cdot}22} \times \frac{1}{1{\cdot}22}$ = approximately 64 per cent of the r.p.m. of the two working shafts in *Superb*, or 67 per cent of that of the single working shaft in *Savage*. In the latter they were measured as 60 per cent, the same as reported by *Glasgow*.

The method given above is only approximately correct, since much more complicated methods are necessary for the exact study of propeller performance, and the results are only applicable when the non-driving shafts are trailing freely. The method cannot be extended to locked shafts because among other things, cavitation is likely to affect the results. Trials carried out in H.M.S. *Daring* with one shaft locked, showed that the driving shaft when exerting the normal full power torque reached 250 r.p.m. at a speed of 20·5 knots which would require 170 r.p.m. on two shafts, and that the reverse torque in the locked shaft was about 47 per cent of full power torque. Thus under these conditions about half the torque or thrust (since they bear a nearly constant relationship) of the driving shaft is propelling the ship and the other half is dragging the locked propeller.

Many ships must have some record of the shaft conditions when trailing, and it would be interesting to learn whether they confirm or refute the figures given above.

(*Sgd.*) A. J. H. GOODWIN,
Commander (E), R.N. (Retd.)

SIR,

' The Artificer Apprentice—Leadership Training '

In the conclusion of the above article in the July 1953 issue of the *Journal*, the authors state :—

> ' The old-timer trained in the pre-war years might well exclaim " Why waste all this time when they should be learning their trade ? I never had all this nonsense, and what harm has it done me ? " '

As an old-timer, having been trained in H.M.S. *Fisgard* between 1920 and 1925, I am at a loss to understand how the authors arrived 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.

During my apprenticeship, about 700 boys were cooped up in a collection of old ships in the creek beyond Portsmouth Dockyard. There were no ' Bens ' to climb, no parade grounds and no beer bars ; but apart from this, every advantage was taken of the limited facilities to enable the apprentices to take their full share in organizing and running the ship's magazine, debating societies, concerts, bands, dances, indoor and outdoor sports, boat outings and all the various activities mentioned in the ' Leadership ' section of the article, with the above stated exceptions.

Parade ground instruction was undertaken at the R.N. Barracks on the conclusion of final examinations, and every facility was afforded to each boy to march his squad over the precipice when told by the Gunnery Instructor to take charge—just as the squad was disappearing over the horizon.

There would appear to be no higher percentage of working time absorbed on non-technical instruction than heretofore, which seems to be the only direct indication as to whether the present-day apprentices have more leadership training than in the past. The old-timer felt that less time should have been spent on fitting-work with a hammer, chisel and file to a standard far in excess of Service requirements, and more time should have been devoted to other activities which come under the heading of leadership training, the latter gaining at the expense of the former.

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

SIR,

Boiler Blow Down Cocks

I was very interested to read in your excellent *Journal* about the mishap to a Klinger blowdown cock in H.M.S. *Gambia* (Vol. 6, No. 2, page 171).

A similar mishap occurred in our *Hampton Ferry* some months ago after 18 years' satisfactory service. I thought it would be of interest to you to know we arrived at the same conclusion and are therefore replacing the present type by modified cocks having an increased depth of body of $\frac{3}{8}$ in., giving an additional four threads.

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